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German Industry Today

By Edward J. Mehren
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WHAT is happening in Germany? This has been a leading question with Americans ever since the war. During the inflation period, we were disturbed at the low-priced goods she shipped to us. Her competition is still felt in some of our home markets, while reports of her activities in industrial consolidation and cartels prompt frequent repetition of the question.

An exact, but brief, answer is not easy to give. The evidence in some matters is conflicting, indicating that there is still unsettlement. Nevertheless, the general situation can be stated briefly, and answers hazarded to those obvious collateral questions, Whither is the Reich going? How far will it go? To begin with, let us build a background. Here is a nation that had grown to industrial greatness in a generation. She had become one of the leaders in international trade. The German commercial flag was everywhere. Then she was pushed from her high estate. Through the Versailles Treaty she lost 13 per cent of her area, 10 per cent of her population, 20 per cent of her coal mines, 74½ per cent of her iron ore, and 68.3 per cent of her zinc ore. Her colonies were seized, her merchant shipping wiped out, her foreign investments largely confiscated.

But that was not all. Inspired by the new nationalization growing out of the war, and crystallized by the application of the theory of "self-determination of small nations," custom barriers sprang up all over Europe and cut off markets. Russia practically disappeared as a buyer. The British colonies adopted Empire preference policies.

Meanwhile, unrest, *following a revolution* (something we are apt to forget) had torn the country. Class was set sharply against class, and social legislation, far reaching in type and cost, was enacted. Finally, the mark took a long slide to nothingness, completing the wreckage of the economic structure. In 1920, the political rebuilding of the Reich was started; in 1923, through the stabilization of the mark, the economic.

Now, after four years of striving, where stands the Reich? Whither is it going? How far will it go?

First, let it be said, that the progress has been astonishing. I was here in 1920, when everything was at a low ebb. I was here in 1924, eight months after the mark had been stabilized, when hope had again been kindled in the German breast, but when only the beginnings of progress were visible.

What a contrast now! The industries are effectively organized, the workers are fairly well satisfied and are working diligently, the general spirit of unrest and discontent has disappeared, though some claim that this is only on the surface, and, above all, there is a drive and a spirit of sacrifice and devotion among the leaders and managers of industry and trade that is inspiring. They do not know how long it will take to reach a truly stable economy, with the workers on a satisfactory standard of living and with industry on a reasonable net earning basis. But the immediate tasks are clear and to their solution the leaders of German commerce, industry and engineering are applying tremendous energy, intelligence and patience. They are working hard and thinking hard. The workers in large part have recovered from their post-war radicalism and are working with an industry that wins general approval from employers. They, too, have caught the spirit of sacrifice, as shown in the answer they give to questions about their economic condition. "Yes," they reply, "we can get along." Possibly one should describe their attitude as one of resignation to inevitable conditions; yet the reply is often followed by an expression of confidence in the future. At least, if the worker's attitude lacks the fire shown by the leaders of industry and trade, the acceptance of conditions, except in Communistic circles, is without resentment.

The immediate tasks are clear and to their solution the leaders of German commerce, industry and engineering are applying tremendous energy, intelligence and patience. They are working hard and thinking harder

Just now business is quite active. Mills and factories are running to good capacity. The number of unemployed, which reached 2,000,000 in January, 1926, has gradually declined, standing at 649,000 at the end of May. But it is feared by some close students of industry that the present demand for goods will not keep up. The stimulated production is for German use and not for export, and these students failed to see a sound basis

First of two articles. The second will appear in an early issue

for the heavy internal buying of domestic manufactures.

The present improved situation is due largely to the British coal strike and to some extent to the Russian orders taken last year. The British strike created a demand for German coal, and its production, in consequence, ran above that of 1913, excluding the lost areas. The mines, in turn, bought new equipment, headworks, etc., thus stimulating the steel trade. The machinery industry even today remains active, though new inquiries are dropping off. Had the steel production been for export, the situation would be brighter. The situation has been helped, too, by orders for ship steel, the builders desiring to take advantage of the subsidy which applies only to ships built this year. The Russian orders helped, but were of much less importance than the strike stimulus.

While, therefore, the condition just now is favorable, relative to the situation late in 1925 and early in 1926, it is still abnormal and must remain so for many a year.

The overshadowing adverse conditions are lack of capital and burdensome taxation. The meager supply of capital comes up in every conversation with bankers, merchants and industrialists. It hampers chiefly in inability to finance foreign trade. Right now, additional large orders could be secured in Russia if they could be financed. The same handicap is felt in trade and in other parts of the world. One instance will suffice to explain the situation. A South American government had agreed to finance a large public works job. The Germans, on bids, were assured of the orders, when an American banking firm came along and offered to do the financing. The government promptly withdrew and American manufacturers got the orders. A second handicap imposed by lack of capital is the inability to make plant improvements that will help reduce production cost. Moreover, the increase of the supply in capital will be slow, except for foreign borrowing—which, obviously, has disadvantages. Taxes are too high to permit of rapid capital accumulation by industry itself and by the public. However, a beginning has been made in building up capital and in April of this year savings banks, for example, had deposits of 3,854 million reichsmarks. (This, however, is only 20 per cent of the pre-war deposits, and, of course, with the higher cost index, represents, say, 66 per cent of the pre-war gold value of a similar amount of savings). Further evidence of improvement in the money supply is shown by interest rates. Thirty-day money in 1925 cost 10¼ to 10½ per cent. In 1926 it came down to 5¾. It had risen since the first of the year, and is now about 6½ per cent.

The overshadowing adverse conditions are lack of capital and burdensome taxation. The meagre supply of capital comes up in every conversation with bankers, merchants and industrialists. There are also what are known as the social burdens. In addition there are the high tariff walls that interfere with export trade

The second major industrial handicap is taxation, and this works in two ways, first, by taking large percentages of net profit from the industries themselves and, second, by taking so much from the individual that he has little to invest in industrial securities either directly or through savings and insurance deposits. Nevertheless, the investment fund is growing slowly as indicated by savings banks deposits referred to above and by recent successful flotation of loans in Germany.

An adequate discussion of the tax question would in itself take an article as long as the whole of this one. The net profits tax, to start with, takes 33 per cent of the net, 20 per cent for the Reich and 13 per cent (though this varies somewhat) for the local community. There is a ½ per cent tax annually on the total value of the physical property used in trade and industry, including raw materials and finished products on hand; a ¾ per cent sales tax on goods sold in Germany; a Dawes bond tax that averages annually ¾ per cent of the total value of the physical property; a tax of 2½ per cent of the total paid for salaries and wages. Of course, there are the usual types of real estate taxes payable to the states and communities. Then, on real estate transfers the purchaser pays a tax of 7 per cent of the sales price—an expensive item when industries are consolidated. If one establishes a new company or issues stock, he pays a tax of 4 per cent on the values invested in the property or represented by the stock issue. If an industry retired bonds or stocks at sacrifice prices during the inflation it pays a tax, once, designed to give the Reich part of the profit accruing to the industry from the transaction.

In total the taxes on moderate sized and large companies run from 40 to 50 per cent of the annual net income—when there is net income. What this means in terms of capital handicap has already been mentioned, but it is a sales handicap as well. For example, before the war the average tax carried by a ton of rolled steel shapes (I-beams, angles, T-shapes, etc.) was 0.97 marks per metric ton; this year it is 7.45 marks per ton, an increase of 668 per cent. For one company making heavy factory and steel mill equipment — more highly finished products than steel shapes—the tax burden per metric ton in 1913 was 2.32 marks and in 1924, 40.20 marks. For the same company, taxes in 1913 were 0.32 per cent of the selling price and in 1924, 5.00 per cent. Taxation of individuals is also heavy and varied. Income taxes start at 10 per cent on incomes over 1,200 marks. All over 8,000 marks pays 12½ per cent; above 12,000 marks, 15 per cent, rising to 45 per cent in the highest bracket. Then there are church taxes, legally imposed, amounting to 25 per cent of the income tax paid to the government; an annual tax of ½ per cent on one's whole fortune and very heavy real estate taxes. An individual's personal taxes may well run over 50 per cent of his income. Therefore, if an individual's income is entirely from stock holdings, 75 per cent of the net profit on his shares would go to the government.

In this discussion, the weight of tax burden is presented having in mind the relative burden of taxation on American industry. No attempt is made, therefore, to compare it with the tax burden on the industries of other European countries.

When people talk of their tax burdens in Germany it is quite common for them to place special stress on the

reparations payments made under the Dawes Plan. They regard these payments as the principal cause of the high taxation; my questioning of people in different walks of life from laborers to industrial managers showed this to be true.

As a matter of fact the Dawes payments for the year ending August 31, 1927, certainly are less than 12½ per cent of the total taxation of Germany including the taxation of the Reich, the states and the communes. The total taxation was stated to me repeatedly as 12,000 million marks, though the June report of the Agent General for Reparations Payments shows that figure to be too small. The Dawes payments for the year ending in August will be 1,500 million marks. Of this amount only 410 million come out of the budget, the other 1,090 million being raised through the transport tax, the interest on German industrial debentures and the interest on German railway bonds. In the last analysis, of course, this additional 1,090 million falls on industry and agriculture. But again taking the inadequate 12,000 figure, if this should remain unchanged when the "standard" reparations year of 1928-1929 is reached, the reparations payments would then be 21 per cent of this figure. The payments then annually will be 2,500 million marks.

It is apparent, then, that there is in Germany, a widespread misunderstanding of the "Dawes burden" as the Germans call it; and the misunderstanding extends to educated people whom one would expect to find well informed.

Since the total of all German taxation has risen from 4½ billion to, say, 10.8 billion, exclusive of reparations, it may be asked whether there is not extravagant management and whether the total could be reduced. The rise is due largely to the war burdens of pensions, to payments to those who suffered damages or injuries in the war, to sickness insurance benefits, to special appropriations for the help of the unemployed, for state aid for housing and for other purposes believed unavoidable and outside the range of ordinary government expenditures. It is admitted, though, that all government service was greatly expanded during the war, and there is the wish that it might again be reduced. But the fact, so far as industry is concerned, is that these taxes are now levied, must be paid and are therefore a burden on industry.

Social Burdens Also

But there are still other burdens and handicaps. There are, for example, what are generally called here the social burdens. These consist of the payments which industry must make to special funds, such as those for sickness insurance, unemployment and invalid and old age pensions. These payments are in addition to the requirements of the budget for extraordinary assistance to unemployment and sickness insurance funds. The extents of these burdens can be shown by a few examples.

Against this burden there is some complaint among industrial managers and a feeling that the workers have demanded too much. However, it would appear that these complaints are surface indications only, an evidence that the load is chafing but not that, if the issue were raised, they would fight hard for the removal of the burden.

Obviously, Germany with her large population and her highly developed industrialism cannot consume at home all she can manufacture. But in foreign trade she strikes high tariff walls everywhere. This barrier is all the more serious, because Germany has a large foreign debt—reparations and loans, the latter chiefly from America—which she can pay only by having an export balance. The unfavorable balance had been decreasing during recent years. In fact, by making a special selection of an annual period, namely, the year closing Oct. 31, 1926, an export balance of 176 millions is found. Recently, the adverse balance has sharply risen, due to rapid increase in importation of raw materials caused by the internal trade boom.

Courage, Vision and Hard Work

As a result of the conditions recited the whole complexion of business in Germany is such as to discourage the stoutest hearts. Many companies have, indeed, had to pass their dividends recently. Yet in the situation are favorable factors. One of these is the curtailment of speculation through the action two months ago of the Reichsbank, when it discouraged loans for stock exchange purposes. This should result in the diversion of money into investment channels. Another favorable, even dominant, factor is the courageous attitude, broad vision and hard work of the leaders.

Still another favorable factor is a labor cost relatively low compared with that of other countries, but coupled here with diligence and high intelligence. The skilled workers get from 0.85 to 1.00 mark per hour, depending upon the industry and district. Even at this wage there is complaint among industrial managers that the worker is demanding too much. Labor is said to be in the saddle. The official wage arbitrators are claimed to have a political bias and, uniformly, to favor labor.

Evidence on these points, however, is conflicting. While, for example, it is agreed that the wage arbitrators have a leaning toward labor, because they are appointees of the Ministry of Labor whose function it is to look after the interest of the workers, it is maintained by people who try to be impartial that, on the whole, the arbitrators have been fair. Further, in defence of the worker, it is claimed that the wage purchasing power today is below that of pre-war times. In other words, the laborer is defended in his demands because it is believed that he is bearing a fair share of the burden through reduced standard of living. What wage increases he has received are claimed to be only equitable.

Again the worker is defended because of the spirit he has shown in accepting the desirability of industrial rationalization, which, for a time, will put a heavier burden, through unemployment, on the working classes. Naturally, the word "unemployment" is feared here, because of the suffering attendant upon being out of work. Nevertheless, the worker agrees to the rationalization idea as essential for the economic rebuilding of Germany.

Further, even the employers testify that the works' councils (Betriebsrat) established by law in every factory, have, in general, ceased to be radical and political and are a help rather than a hindrance.

Criticism is heard, too, that the worker spends too much money. With the young people, who have known nothing but war and inflation, this criticism is undoubtedly true; not that they spend much, for they have not much, but that they do not save from the little they have. With the older people, however, the old traits are reasserting themselves and saving is beginning.

Finally, it should be considered remarkable that the working people, with their standard of living reduced and a revolution, with conditions nearly chaotic, only nine years behind have settled down so well. Indeed, the judgment seems sound that one of Germany's greatest assets is her steady, industrious, intelligent workers.

Book Reviews

ESSENTIALS OF METALWORKING. By Edward Berg and Bristol E. Wing. One hundred fifty-five pages, 5x7¾ in., cloth boards, illustrated. Published by The Manual Arts Press, Peoria, Ill. Price $1.32.

A PURELY elementary book for the use of students in metal working. The first sixty-eight pages are devoted to small tools and their uses. Four chapters treat of the common metals and alloys; their properties and uses. The four last chapters deal with such subjects as shaping metals by casting and forging; heat-treatment; methods of joining metals; and a short description of the ordinary machine tools. An appendix of ten pages contains various tables and data.

The purpose of the book, as stated by the authors, is to supply the need for material dealing with the tools and fundamental processes common to many metal-working activities; also that a text book is necessary because when explanation or information is given orally, the average student does not retain all of the essential points, and a book of this kind will help to impress them on his mind.

FORECASTING BUSINESS CONDITIONS. By Charles O. Hardy and Garfield V. Cox. Four hundred and thirty-four pages, 5x7½ in., cloth boards. Published by the Macmillan Co., 60 Fifth Ave., New York City. Price $4.

THIS book concerns itself with a study of business crises and depressions, considered from the viewpoint of the practical business man and investor. The author's aim has been to set forth the best method by which the individual can predict the course of business prosperity during a comparatively short time. A study has been made of the methods and forecasts of several well-known economic agencies, in so far as their work has to do with the prediction of changes in prosperity. The various indices of production, employment, trade, and business activity are discussed.

The book, well organized, accurate, and containing helpful charts, should be of practical use to business men as well as the great body of investors, throughout the country, who are interested in industrial securities.

ACCOUNTING. By Paul Joseph Esquerré. Director of the New York Post-Graduate School of Accountancy. Three hundred sixty-nine pages, 6x8¾ in. Cloth boards. Indexed. Published by The Ronald Press Co., New York. Price $4.50.

THIS volume is not an elementary text. but is a comprehensive treatise on the various phases of higher accountancy in its practical application to the management of business. According to the author accountants have become philosophers in search of business principles, because of their position in trying to ascertain the cause of the ailments from which industries suffer. Accounting is based on theory, and its usefulness to business depends upon the base upon which its theoretical structure is erected, and upon the degree of skill of its builders.

The author has divided the book into twenty chapters, taking up such subjects as: Financial statements, the balance sheet, statement of operations, statements for credit, informatory statements, and the valuation of inventories. He devotes seven chapters to explanations and discussions of tangible and intangible assets and investments. These intangible assets include goodwill, patents, trademarks, franchises, and development work, the valuation of which manufacturers are constantly called upon to decide. The various methods of taking care of depreciation and obsolescence are also considered. The last two chapters take up the subject of capital stock and surplus profits. The book is subject paragraphed for easy reference. Besides being a textbook for accountants, it makes a useful volume for executives and owners of businesses who desire to get a better understanding of the higher accounting and financial transactions employed in business.

WAGES IN THE UNITED STATES, 1914-1926. One hundred and thirty-nine pages, 6x9¼ in., cloth-board covers. Published by the National Industrial Conference Board, 247 Park Avenue, New York, N. Y. Price $2.50.

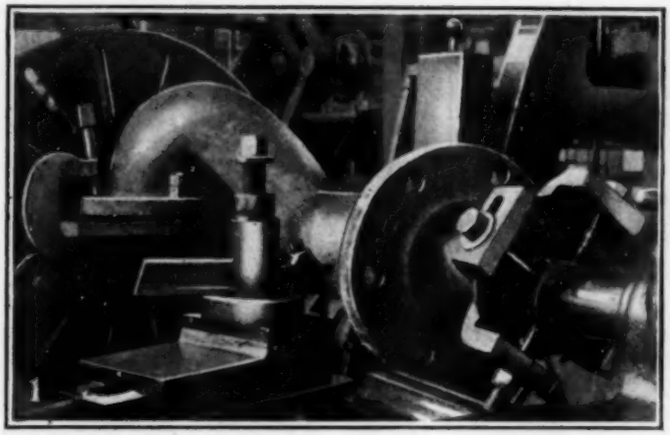
THE new volume on wages published by the National Industrial Conference Board is the fourteenth publication of that organization dealing with the trend of wages, hours of work and employment. These studies have been progressively broadened in scope from year to year, and this latest affords a comprehensive picture of wage conditions and movements in all important occupational fields. Particular attention has been given in the present study to the relation of the wage situation during 1926 to business and industrial conditions during that year. The pronounced stability and relatively high level of wages during the past three years in the face of declining prices is dealt with as one phase of present conditions especially worthy of study.

A novel note is struck by the report in the declaration that the contents of the wage earner's envelope in many instances no longer represent his sole income; that, while the worker's wage and his income used to be synonymous, this is no longer universally true. Developments in the field of industrial relations, the report points out, have advanced to such a degree that the many indirect benefits provided for the wage earner in their cumulative effect mean a considerable saving and supplement his income in ways no less tangible though they may be inconspicuous. Bonuses based on production, quality of work, attendance, promptness or long service; profit sharing, employee stock ownership, pensions, health, accident and group insurance and, in some cases, unemployment insurance, co-operative purchasing plans, industrial housing and transportation at less than commercial rates are some of the benefits cited as examples of supplements to wage incomes. Emphasis is laid on the fact that the average family income is no longer confined to that of one bread winner, as modern business organization has greatly extended opportunities for other members to contribute to the family support.

This new study of the Conference Board covers wages in agriculture, in the public utilities, in the building trades and on the railroads as well as wages in 25 important manufacturing industries. The marked stability of wage earnings is pointed out as a fundamental factor in the steady progress of industry.

Erratum

In the review of Wings—the Story of Flying, on page 898, the number of pages was given as 180 instead of 380. This volume is the annual Aircraft Year Book of the Aeronautical Chamber of Commerce.



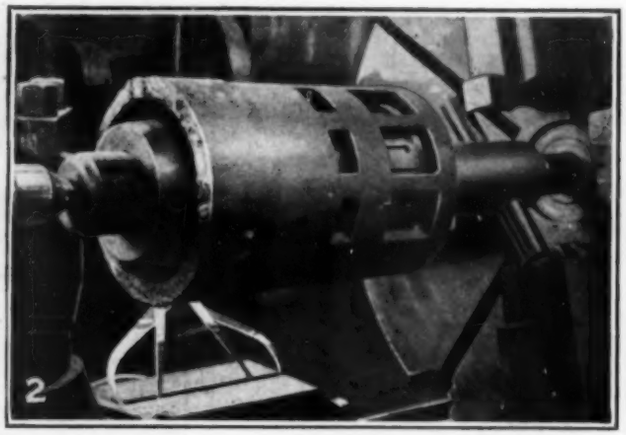


Fig. 1—Turning a steam pipe for a casing collar. Fig. 2—Expanding mandrel for valve-chamber bushings

Southern Pacific Repairs at Algiers

By Frank W. Curtis
Western Editor, American Machinist

Turning steam pipes—Expanding mandrel for valve chamber bushings—Reseating tool for injectors—Set-up for turning tumbling shafts—Dismantling injectors—Dies for spring bands

ONE of the most recently-built shops of the Southern Pacific System is at Algiers, La. The machine and erecting shops are housed within a building arranged with twelve parallel pits on one side, having the machinery directly opposite. In the central portion, on the ground floor, is the driving-wheel machinery and the handling and storage space, all of which is served by a 7½-ton crane. Above the handling and storage space is a balcony containing the toolroom, the electrical shop, the air-brake department and the brass shop. Many special tools are in use and they have been successful in lowering the cost of repairs. Steam pipes, on account of their irregular shape, necessitate a special holding device for turning the outside of the pipe, just above the lower flange, for the fitting of the air-tight casing collar. The device is illustrated in Fig. 1. Prior to installing the work in the machine, a centering plug is placed in the straight end. The plug has six locating pins, tightened against the inside surface of the pipe by a tapered plunger operated by a screw. The pins are arranged in pairs so that the work will be aligned and supported properly. A centering yoke is then screwed on the projecting end of the plug, after which the assembly is placed in the machine. The offset end of the work is clamped to an angle plate attached to the faceplate of the lathe. The opposite end is supported by the tailstock center fitting into the adjustable centering plate in the yoke.

Valve-chamber bushings are turned, faced and chamfered in a lathe, being mounted on expanding mandrel. In Fig. 2 the set-up is illustrated. A bushing, slit in twenty-four places, alternately from each end, and having a tapered bore, fits over a corresponding tapered part of the mandrel. The bushing is expanded by forcing it on the tapered part of the mandrel by means of the large collar nut to be seen at the left. Steam, water and delivery ends of injectors have their joints reseated by a hand-operated tool attached to the threaded portions. In Fig. 3 is illustrated the tool as set up. Constructional details of the tool are illustrated in Fig. 4. The body *A*, screwed

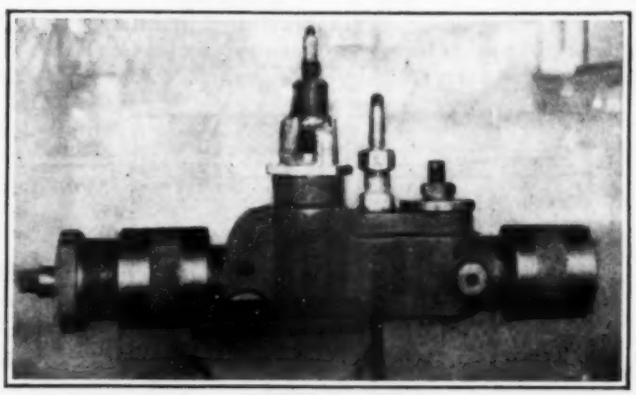


Fig. 3—Reseating steam and water ends of an injector

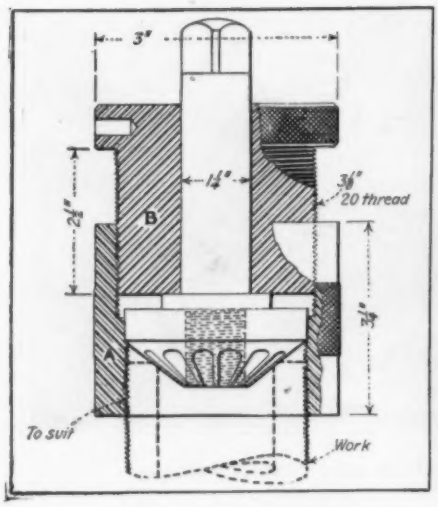


Fig. 4—Details of the reseating tool

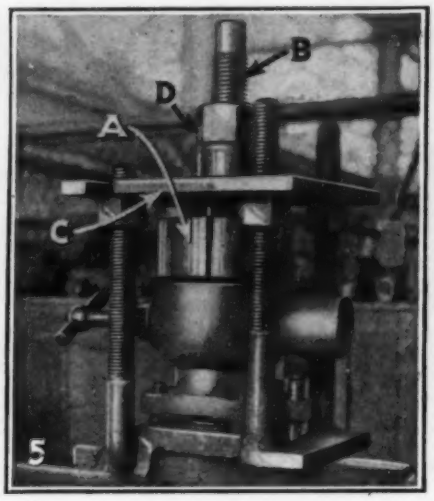


Fig. 5—Tool for parting injector bodies

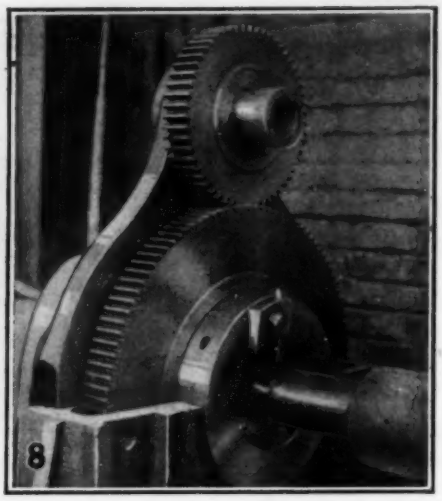


Fig. 8—Turning unit for tumbling shaft

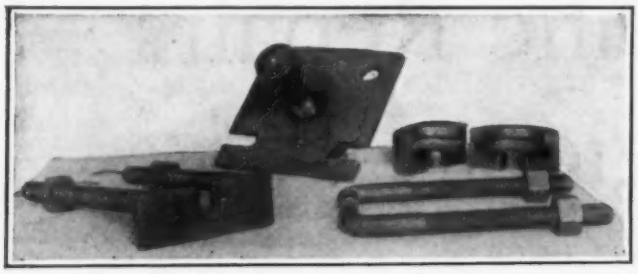


Fig. 6—Parting tool dismantled

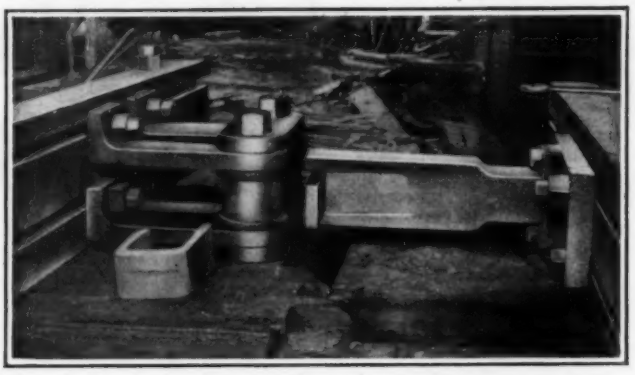


Fig. 9—Forging a spring band

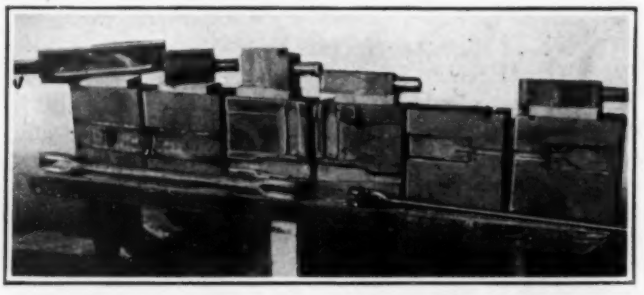


Fig. 10—Dies used on a 2½-in. forging machine

to the injector, carries the reseating tool and the bushing *B* for feeding the tool to the work. After the device has been attached to the injector, the tool is revolved by a wrench applied to square end of its shank.

In separating the front and rear sections of the injector, to avoid marring them by the use of a hammer and wedges, the device shown in Fig. 5 is used. The split collar *A* is recessed to fit over the outer flange of the front section of the injector, and over a solid collar on the lower end of the screw *B*. The plate *C*, through which the screws *B* passes freely, bears against the end of the front section, and carries the four bolts shown. Two of the bolts are hooked into holes in the rear section, while the other two are connected by a plate that bears on a flat part of the same section. By turning the nut *D*, the plate and bolts are forced downward, while the split collar is pulled upward, thus drawing the two sections apart. In Fig. 6, the parts of the device are shown.

On account of the projecting arms being an integral part of tumbling shafts, the piece is difficult to machine on its end sections unless a lathe having a large swing is available. The set-up, at this shop, is handled as illustrated in Fig. 7, in which the work is held stationary between centers. The overhead shaft *A* is driven by the gear *B*, connected to the machine spindle. In turn, the shaft drives the turning head *C*, attached to the lathe carriage. The turning head is illustrated in Fig. 8. Spring bands are hot forged to a U-shape in one operation from a flat bar, as illustrated in Fig. 9. The punch, attached to the ram, is shown with a blank in place. The die consists of two rollers, mounted in brackets, between which the work passes as the machine is closed. The dies illustrated in Fig. 10 are used in the production of various parts used in freight cars.

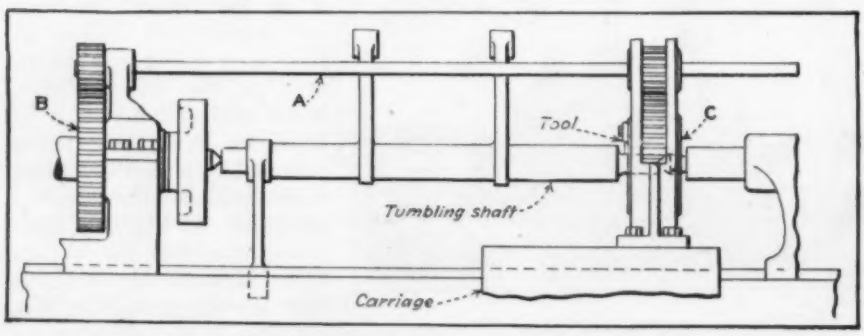


Fig. 7—Attachment for turning tumbling shafts

National Screw Thread Standards Compared

By JOHN GAILLARD
American Engineering Standards Committee

Manufacturing tolerances of National Standard (American), British Whitworth Standard and German Whitworth Standard threads — Root clearance — Tolerances on metric threads

THE standard systems of screw-thread fits in the countries where such fits have been established, will be explained by means of diagrams showing the limits of the pitch diameters of both threads. The basic pitch diameter will thereby serve as the reference line.

In the American standard on screw threads, four different classes of fit have been adopted, as shown in Fig. 3 at *A*, representing for each of these classes the tolerances on the pitch diameters of coarse thread for a screw and a nut with a nominal major diameter of 1 in. They are the "loose," "free," "medium," and "close" fits, also designated in this order by the numbers 1 to 4. In all classes of fit and for all sizes of screws and nuts, the tolerances on the pitch diameters of both mating parts are equal. The minimum pitch diameter of the nut is equal to the basic pitch diameter, in all classes. The maximum pitch diameter of the screw is below basic for the loose fit, basic for the free and medium fits, and above basic for the close fit. Therefore, in class 1, there will be a clearance even between the sides of the largest permissible screw and the smallest permissible nut, that is, in the case of the tightest pos-

The second and concluding article.

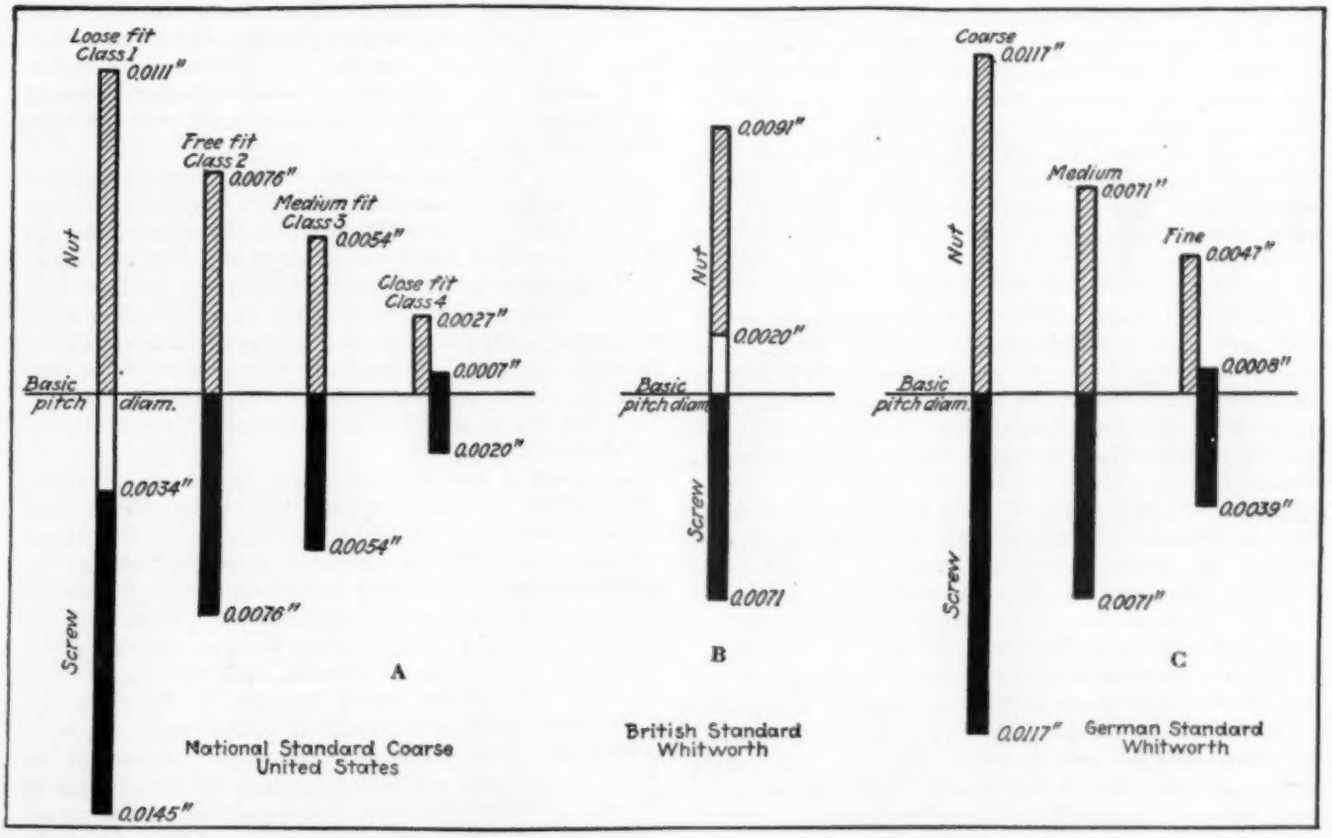


Fig. 3—Limits for the pitch diameter of screw and nut of the National Coarse (American), British Whitworth, and German Whitworth standard threads, 1 in. nominal size.

sible fit. For classes 2 and 3 there will be "metal-to-metal" contact in the case of the tightest possible fit, while in class 4 there may be either an interference fit, a metal-to-metal fit, or a clearance fit between the sides of the thread, on screw and nut, depending on the actual sizes of the pitch diameters.

Diagrams *A* and *B* in Fig. 4 represent, drawn to relative scale for 1-in. mating parts with coarse thread, the loosest and the tightest fit, respectively, that may obtain between screw and nut in class 2 (free fit), for threaded parts made of unfinished hot-rolled material.

According to the American Standard, the minimum major diameter of the nut *theoretically* equals the basic major diameter, but *practically* allowance is made for a clearance between the crest of the maximum screw and the root of the minimum nut, as follows: In actual manufacturing, the thread on the minimum nut is cut by a tap whose crest has been rounded by wear and therefore cannot produce the contour of the sharp-edged basic crest. A rounded contour as shown in Fig. 4 *B* (desirable inasmuch as it provides crest clearance) is therefore permitted by the Standard, provided the nut be not rejected on the major diameter by a "Go" plug gage, the crest of which has the basic form and dimensions. Such rejection would indicate interference between the root of the minimum nut and the crest of the maximum screw, a condition that is to be avoided, as indicated above.

In the same way, the maximum allowable minor diameter of the screw is theoretically $1/18\,h$ above the basic minor diameter, where h is the basic depth of thread as shown in Fig. 1. However, in this respect also, practical allowance for a worn threading tool (securing at the same time crest clearance), is made by the provision that a rounded root is permissible. This rounding is limited again by the requirement that the screw must be accepted on its minor diameter by a Go ring gage representing the minimum minor diameter (crest) of the nut. Too much rounding of the corners at the root of the screw would evidently cause interference with the crest of the thread on such a gage and therefore would indicate the possibility of interference with the crest of the thread on a nut.

British Tolerances

The British standard for Whitworth coarse thread gives only one set of tolerances. In other words, there is only one class of fit, as represented in Fig. 3 at *B* for mating parts with a nominal diameter of 1 in. The graph shows that the minimum nut is above basic (oversize) as to pitch diameter, while the maximum screw is basic.

Diagrams *A* and *B*, Fig. 5, show the loosest and tightest fits between screw and nut with BSW thread, nominal diameter 1 in. The British have adopted a minimum clearance between the contours of screw and nut that prevents metal-to-metal contact between the sides of the mating threads, even in the case of the tightest fit, *B*. This minimum clearance is taken above the basic profile, and hence in the nut, and has a constant value of 0.002 in. on the diameter for the pitch diameter, the minor diameter, and the major diameter, independent of the nominal size of the thread. The tolerances on pitch diameter are equal for screw and nut.

A minimum clearance of 0.0020 in. on the major, pitch, and minor diameters has also been adopted for the British Standard Fine threads (BSF) of all sizes. Two series of tolerances are given for fine threads; one applies to ordinary bolts and nuts, the other to more exacting work requiring so-called close fits. The tolerances for close fits are half those for ordinary work.[1]

Standard tolerances on the British Association (BA) Threads are given for the Nos. 0 (nom. diam. 6 mm.) to 15 (nom. diam. 0.9 mm.), inclusive. The nominal major, pitch, and minor diameters are the high limits for the respective screw dimensions, and the low limits for the respective nut dimensions, for this kind of thread.

The British have also worked out standard tables giving corrections to pitch diameter (which they call "effective diameter") required to compensate pitch and angle errors in screw threads of Whitworth form.

German Standards

In Germany there are two national standards for Whitworth coarse thread; one with a basic profile identical to that of the British Standard Whitworth thread, the other with a basic profile, the crests of which are truncated. The former kind is to be considered as a fastening thread for general use, while the latter kind, because of its larger crest clearance, is meant for special cases. For example, when a ball bearing must freely pass over a threaded part of a shaft in order to fit closely around a collar of slightly larger diameter on the same shaft, it may be desired to keep the major diameter of the thread as small as possible. The reduction in major diameter due to the truncation of the crests of the thread on the shaft, will then be a logical means to this end. For both forms of Whitworth thread, tolerances and allowances, including crest clearance, have been established.

The Germans have adopted three kinds of fit between bolt and nut applying to fine, medium, and coarse products. The tolerances on the pitch diameters of screw and nut for a certain nominal size of thread are equal and increase for the three classes of product in the ratio 1 : 1.5 : 2.5, respectively.

In Fig. 3 at *C* is shown the limits of the pitch diameters of a 1-in. German screw and nut with Whitworth coarse thread. The minimum pitch diameter of the nut is basic for all of the three classes of fit. The maximum pitch diameter of the screw is basic for medium and coarse class products, and above basic for fine class products. Therefore, in none of the German classes of threaded products is there, in the case of the tightest possible fit, a clearance between the corresponding sides of both threads, as in the British system or in the case of the American loose fit.

Diagrams *A* and *B*, Fig. 6, show the loosest and tightest fits for German "medium fit" Whitworth coarse threads, nominal diameter 1 in. In case of full crests on screw and nut, the minimum crest clearance at the major diameter is obtained by keeping the high limit of the crest on the screw below the basic crest and the low limit of the root on the nut an equal amount above as shown at *B*. For the thread with truncated crests, the high limit of the major diameter of the screw lies below that of the non-truncated thread, as shown by a dotted line. The low limit of the major diameter of the screw is the same for both truncated and non-truncated thread. In the same way, the high limit of the minor

[1]The British close fits for fine threads do not correspond to the close fits as specified in the American Standard B 1a-1924. With an American close fit there may be interference of metal between the threads on screw and nut (see Fig. 3 at *A*), while a British close fit for fine threads is always a clearance fit.

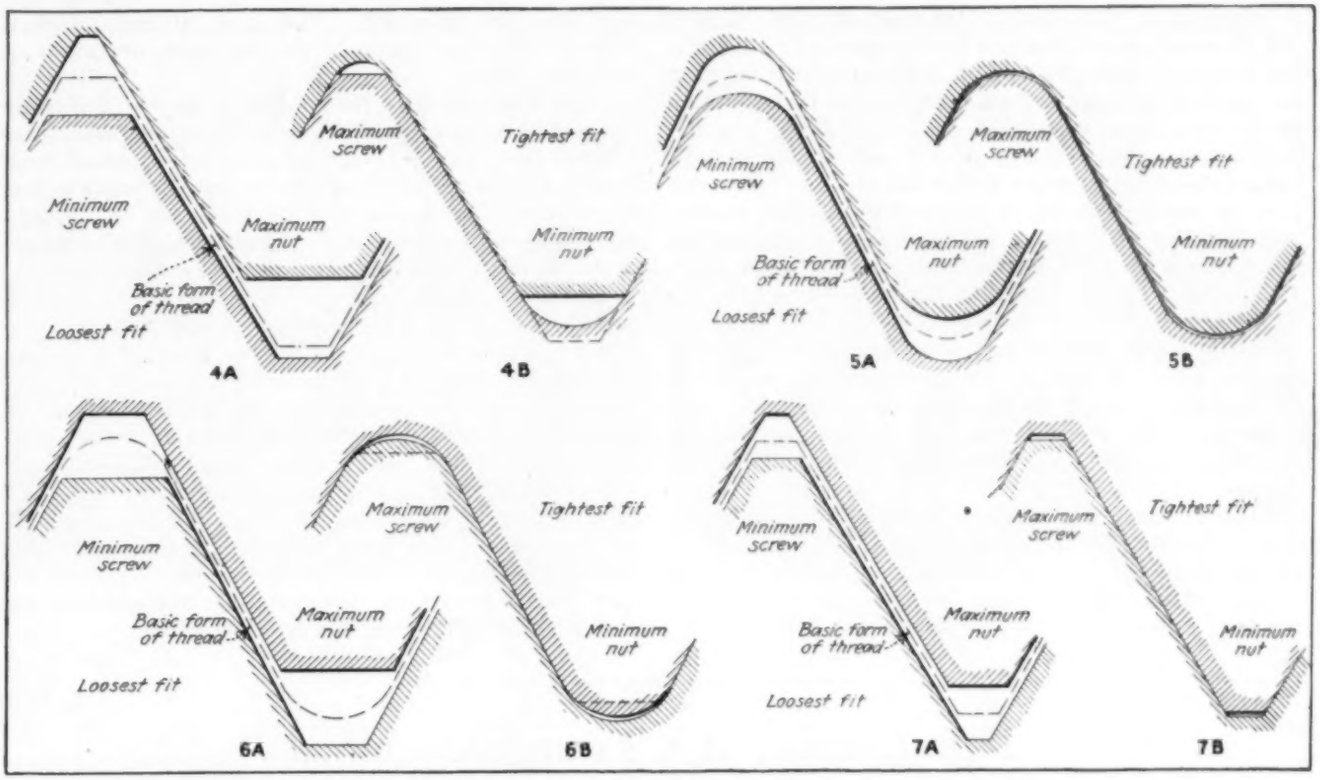


Fig. 4—Loosest and tightest fit between mating parts of National Standard Coarse threads. Fig. 5—Fits between British Standard Whitworth threads. Fig. 6—Fits between German Standard Whitworth threads. Fig. 7—Fits between German Standard metric threads

diameter of the nut is the same for both kinds of Whitworth thread, while the low limit of the full thread is below that of the truncated thread.

The German method of obtaining crest clearance causes the maximum major diameter of the screw to be always below the nominal size. For example, the maximum major diameter of a 1-in. screw with Whitworth coarse threads in each of the three classes of fit is 25.361 mm. (0.9984 in.) for the thread with full crests, and 25.166 mm. (0.9908 in.) for the truncated thread.

A comparison of Figs. 5 and 6 will show that British and German standard Whitworth threads are perfectly interchangeable.

Besides issuing standard sheets giving the manufacturing limits for threaded products, the Germans have also worked out sheets giving the manufacturing limits and the permissible wear for the corresponding thread gages.

The tolerances worked out by the Germans will be adopted without change by the Austrian national standardizing body. A national standard for limits for metric coarse threads has so far been established by the Germans only. The limits are based on a classification of threaded products in three groups in the same way as has been established for Whitworth threads. The principles upon which the fits between the sides of screw and nut are based, are also the same. However, the method of securing crest clearance is slightly different from that adopted for Whitworth threads, this being due to the way in which the metric thread was developed.

Table III—Differences in Pitch Between National Coarse and BSW Thread

Nominal Diameter In.	Number of Threads per Inch	
	NC	BSW
$\frac{1}{4}$	13	12
$2\frac{1}{4}$	$4\frac{1}{2}$	4
$2\frac{3}{4}$	4	$3\frac{1}{2}$
3	4*	$3\frac{1}{2}$

*The number of threads per inch of the National Coarse Thread of 3 in. was recently changed to $3\frac{1}{2}$ by the National Screw Thread Commission. The American Standard will very likely be changed accordingly in the near future.

The Zürich Conference of 1898, in establishing a standard for metric thread, realized the necessity of providing for crest clearance. Therefore, after having decided on a basic form of thread, the S I profile, the Conference also specified that the roots on both screw and nut should be cut deeper than corresponding to the truncated triangle of the basic profile, by an amount not exceeding $\frac{1}{16}$ height of the sharp triangle, or about 0.054 pitch. The conference of 1898 recommended furthermore that the roots be given a round form.[2]

Values for the crest clearance of metric coarse thread varying from 0.045 pitch (Germany and Japan) to 0.054 pitch (France) have been adopted in the different national standards; most countries have selected the value 0.050 pitch. The small variation in this figure does not impair the interchangeability between the different national Metric threads.

In Fig. 7 at *A* and *B* is illustrated the loosest and tightest fit between a German screw and nut with Metric coarse thread of the medium class, nominal diameter 24 mm. (0.945 in.). The nominal size is the high limit of the major diameter of the screw, the minimum crest clearance being guaranteed by the fact that the low limit of the major diameter of the nut is slightly above basic

[2]A *minimum* crest clearance for metric thread equaling $\frac{1}{12}$ height of the sharp triangle, or about 0.036 pitch, has been mentioned in handbooks, etc., in addition to the *maximum* value of $\frac{1}{16}$ height of the triangle. However, this minimum did *not* originate with the Zürich Conference of 1898.

as shown at *B*. The form of the crest and root, whether flat or round, is not specified by the standard; therefore, the limits of crest and root on both screw and nut may be indicated by straight lines, every outline lying between these limits being acceptable.

A Whitworth screw and an NC nut, and conversely, cannot theoretically give together a correct fit. The fact that the angle of thread is different in the two systems (60 deg. for NC, 55 deg. for Whitworth) prevents the proper contact on the sides of the threads. In practice, NC nuts will screw readily on to BSW screws, owing to the larger angle of thread of the former; to screw BSW nuts onto NC screws, however, may require the use of a wrench. Such forcing of nuts on screws against the resistance caused by the interference of metal may cause the latter to flow, and thus deform the sides of the thread, resulting in a connection satisfactory for the purpose.

Thus, in many cases, there exists practical interchangeability between products made in accordance with the two systems, but of course this goes only so far as the number of threads per inch for a certain diameter is the same in both systems. The exceptions in this respect are listed in Table III. The ½-in. thread, which is widely used, constitutes by far the most important of these exceptions.

Assemblies of parts with different angles of threads, although sometimes possible, is far from ideal when considered from the viewpoint of good screw thread practice, and hence efforts have been repeatedly made to find a compromise system between the BSW and NC threads. This subject was discussed in England in 1919 between a group of British and American experts, and again at an international conference in New York in April, 1926. The British delegation submitted at that time the proposal of a compromise thread with an angle of 57½ deg., midway between the BSW and the NC angle. It was resolved that this proposal should be worked out in greater detail by the British delegates and circulated by them to the different national standardizing bodies, which would then lay the matter before the interested groups in their respective countries for their consideration and advice. Up to the present time this proposal has not been circulated. The resolution also mentioned the fact that the conference attached great importance to the method of standardizing the crest clearance.

Pipe Dreams of a Tramp Machinist

The Height of Low Costs

By Glenn Quharity

Years ago Jones ran a mill, forge and foundry, not far from the Brookdell shops where I thought I learned my trade. The mill was not large, even as mills went in those days, but the machinery was heavy and consumed an amount of power out of all proportion to its size.

In one part of the main drive to the mill there was a pair of bevel gears, the driver being nearly 3 ft. in diameter while the driven member was a pinion of about half that size. Both were made of cast iron with the teeth cast in the mold, as was usual in the good old times, and the drive used to keep up a terrible growling night and day, even though it was liberally dosed with goo.

A year's work was about all that could reasonably be expected of one pinion—though the larger gear lasted somewhat longer—and every year about Christmas time when the mill was shut down for a few days the repair gang used to take it off and replace it with a new one. Also, about once in six weeks or so the same gang managed to put in part of a Sunday of overtime in adjusting the drive, smoothing up the rough spots and generally assuring themselves that the whole box of tricks wouldn't jump through the side of the mill before next Saturday night.

Business went on merrily, increasing as time rolled by. Jones was getting along in years and finally decided to hire in a man from the "outside" to take over the active duties of superintending the works. Smith settled into the harness very quietly and efficiently, and for a long time things went on about as usual; perhaps even a little more so. Smith wasn't called superintendent; he was just "the boss."

One day Jones, while looking over some papers in the office, came upon a shop order dated about three months back that called for "1 bronze pinion to sketch," and had the weight, dimensions and other data pencilled upon it. The weight made Jones gasp. He couldn't for the life of him think of a customer who was rich enough and crazy enough to order a bronze pinion of that size, so he hunted up Smith to be enlightened.

"Why," replied Mr. Smith to the query, "I had that pinion made for the angle drive in the mill. It's on there now."

Jones first remarks upon digesting this information were somewhat incoherent and altogether unprintable, but conveyed the impression that Mr. Jones considered Mr. Smith's intelligence to be sub-normal, his antecedents far from what they might have been, and that he—Smith—was about the most expensive man that ever ran a going business into bankruptcy.

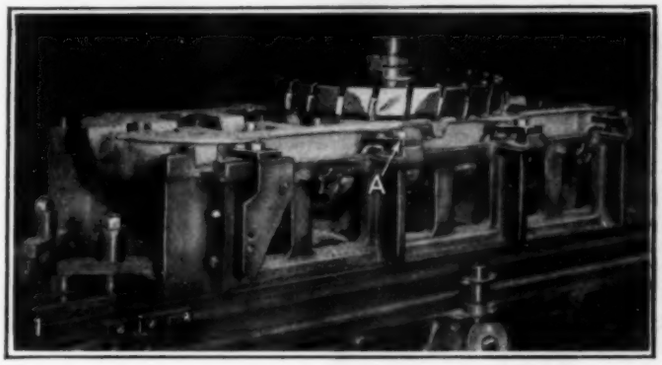
"Hain't you no idee of the cost of things?" he spluttered. "Don't you know that bronze is wuth 'steen cents a pound 'n cast iron don't cost more'n two? That dum fool pinion of yours must've cost nigh onto thutty dollars to get it casted, 'n you coulda made one outa cast iron fer about three."

"Yes, I know it," replied Smith, calmly. "I also know that the cast-iron pinion the boys took out of the drive last Christmas had cost us nearly fifty dollars in wages to the repair gang during the year. The bronze pinion has been in there long enough now so that I know it is not going to cost us a cent for repairs before next Christmas, and it will still be worth thirty dollars to the brass foundry as new material, even if we have to scrap it then; which we won't, for I know it is good for four or five years yet."

Jones was long ago garnered to his forefathers and sleeps on the hillside near the church, untroubled by racketty gears or corpulent cost sheets. The drive is gone, too, but not to the same place, and the new one that is doing its work does not make noise enough even to distract the attention of the office stenographer.

Smith? He owns the works.

Automotive Production



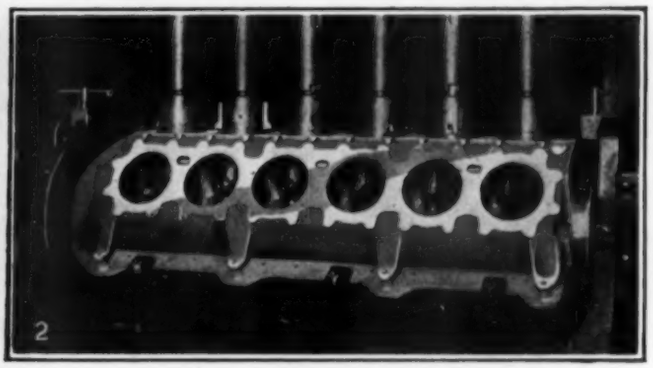


Fig. 1—Milling the oil-pan face of crankcase. Fig. 2—Boring crankcase for cylinder liners

Crankcase Work at the Curtiss Plant

By Fred H. Colvin
Editor, American Machinist

Some of the methods, fixtures and tools used in machining the crankcase of the Curtiss 400-hp., D-12 engine—Studs for holding the cylinder water-jackets set before final boring

THE increasing growth of aviation and the demand for reliable and continuous operation of airplane engines, has led to many developments in both design and manufacture. While the problem is somewhat similar to that of building automobile engines, the necessity of overcoming all defects that might be responsible for an engine quitting its job, necessitates the greatest care possible in all construction details. Since the Curtiss D-12 engine has earned an enviable reputation in aircraft work, it is of interest to note some of the methods used in its construction, and through the courtesy of the Curtiss Aeroplane & Motor Co., Buffalo, N. Y., we are able to show a number of the major operations employed.

While, as before stated, many of the operations are very similar to those found in the best automobile engine shops, it is necessary to bear in mind the great difference in the quality and quantity produced, since this, of necessity, greatly affects the production methods used. The engine has twelve cylinders of considerably larger dimensions than are found in automobile practice, the bore being

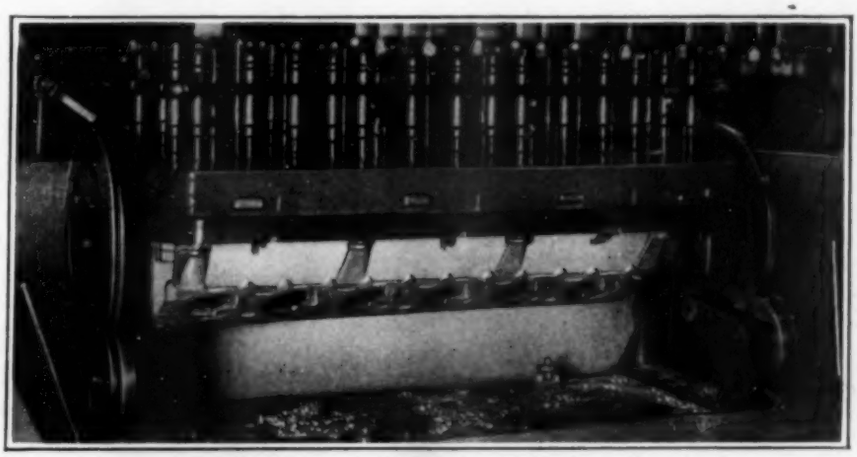


Fig. 3—Drilling oil-pan holes in crankcase

Automotive Production

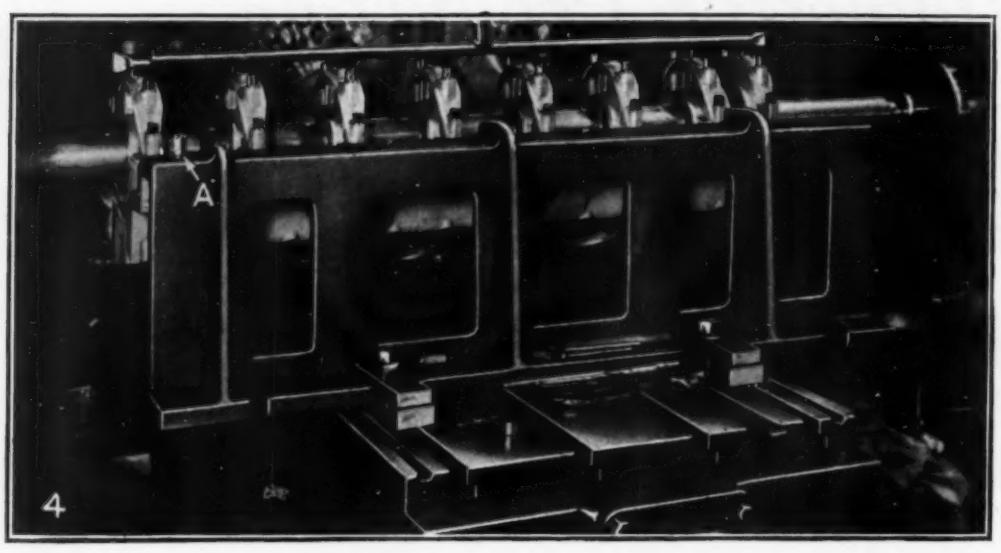
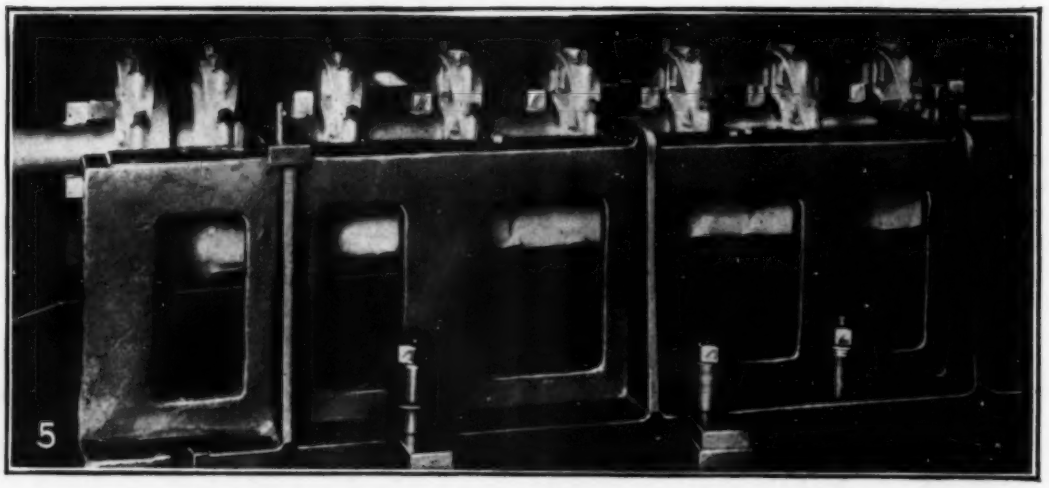


Fig. 4—Rough boring the main bearings. The case is located by dowel holes in the flange and the boring is done while the caps are in place. Inserted cutters are used in the bar

Fig. 5—Facing the crankcase bearings. The case is held in the same fixture as was used in the previous operation. The cutters are double edged so that the bar can be fed in either direction



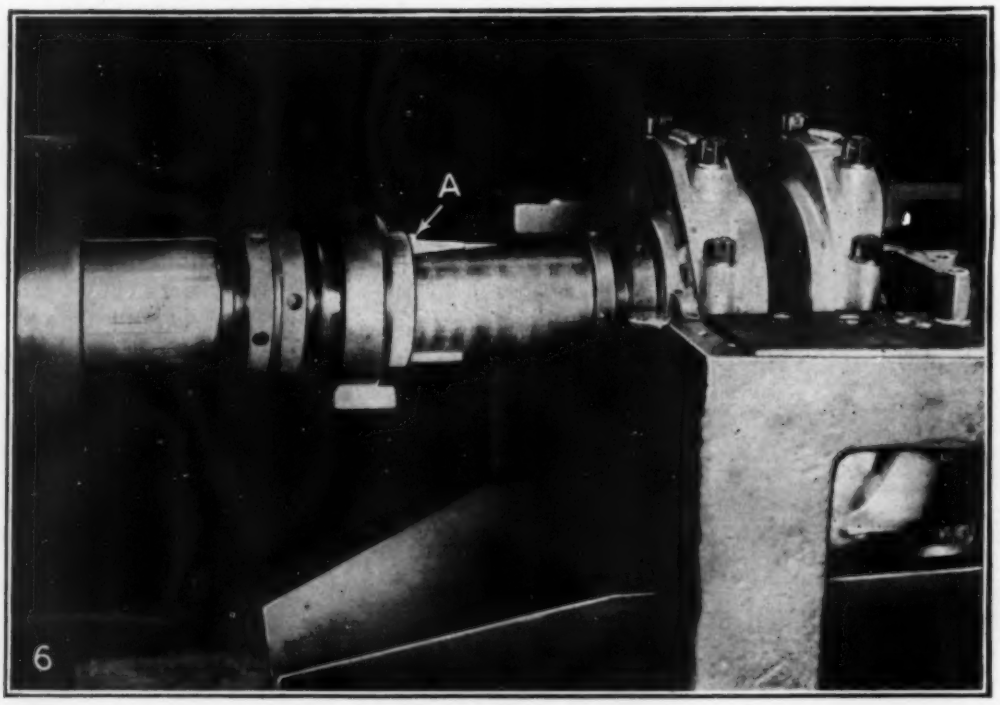


Fig. 6—Tool for cutting the oil-slinger groove. The form tool A is forced out into cutting position after it has entered the bearing. The collar behind the cutter enters the bearing and steadies the bar during the cut

Automotive Production

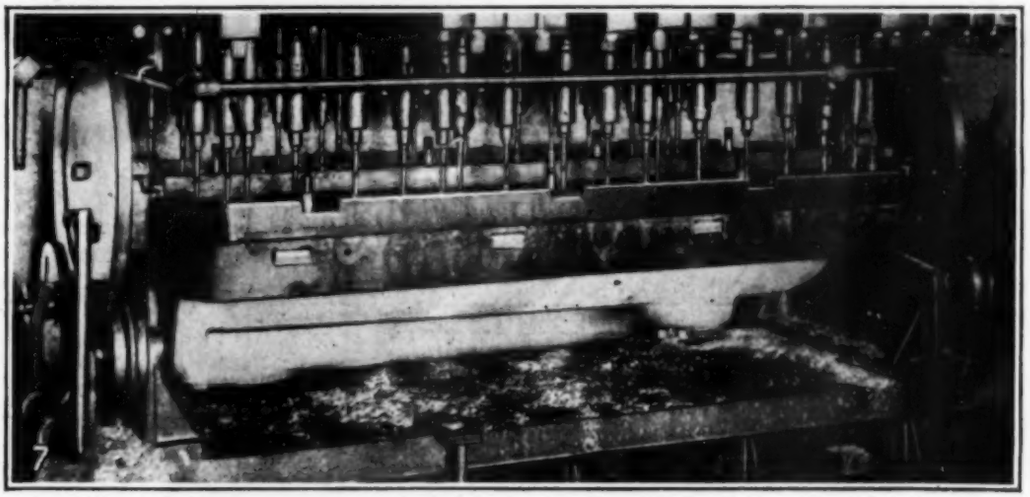


Fig. 7 — Drilling the oil pan. Since the holes in the oil pan must match those in crankcase, the drilling of both is done in the same fixture, the only change being the reversal of the bushing plate

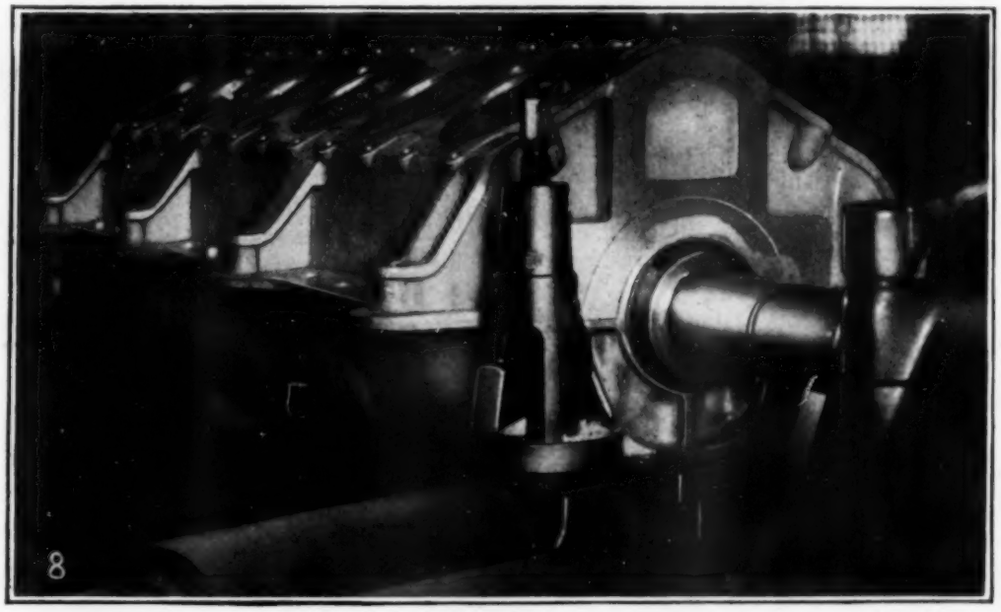


Fig. 8 — Facing ends of crankcase and oil pan. After assembling both parts they are mounted on a mandrel and placed between centers in a McCabe double-swing lathe, the spindle allowing the greatest swing being utilized

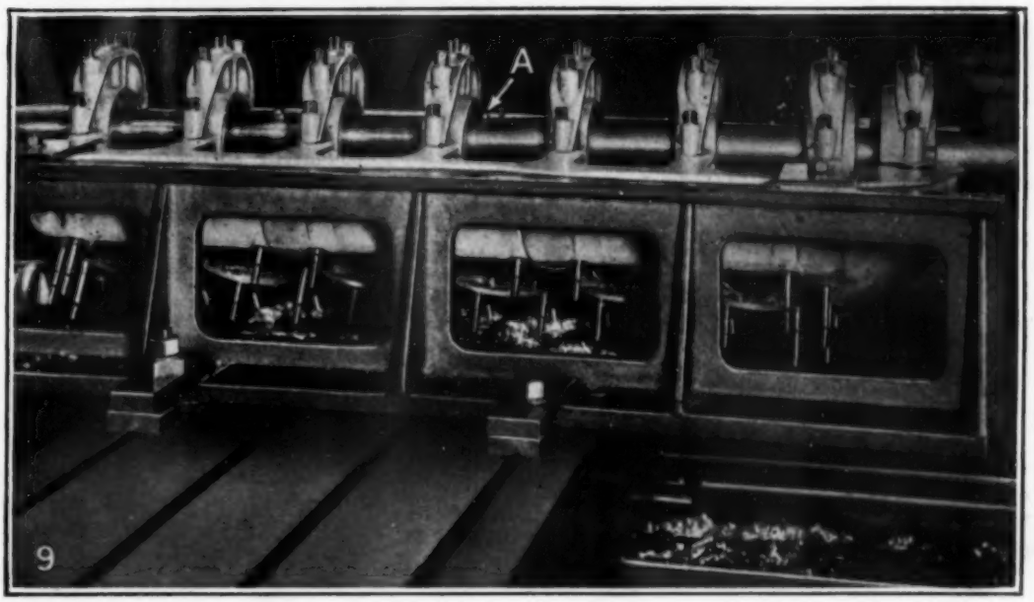


Fig. 9—Finish boring the main bearings. One of the last operations before final assembly. A fly cutter is used, followed by a burnishing tool. About 0.0002 to 0.0003 in. is left for the burnishing operation

Automotive Production

4½ in. and the stroke 6 in. The crankcase is, therefore, considerably larger than that used in automobiles. The milling of the crankcase is shown in Fig. 1, the machine used being a No. 4 Cincinnati vertical, on which a single fixture is used. The clamps have forked ends that reach around the extended bolt bosses and clamp the flange firmly in position, as can be seen at *A*. The shape of the bolt bosses can be seen in Fig. 2, where the holes for the cylinder liners are being bored on a Moline Hole Hog. The fixture for holding the crankcase is supported on trunnions and is provided with an index pin at each end. This is a simple operation, and the rigid spindle and boring tools avoid the necessity of special guides.

Since the weight of the crankcase must be considered, a roll-over fixture is provided for drilling, as in Fig. 3. The bushing plate is mounted on two large disks that rest on flanged rollers to prevent end motion, and at the same time make it easy to turn the fixture. The indexing holes are in the large disk, a pin being used to hold it in the desired position. The holes for the engine-bed rails and the oil pan are drilled at the same setting, the drilling spindles being arranged to handle both jobs without removing the crankcase from the fixture.

The main bearings are bored with the caps in place, as in Fig. 4, using inserted cutters in the boring bar, which is of ample size. The case is located by dowels in the flange holes previously drilled, as at *A*.

Facing in the Same Fixture

Following the finish boring, the ends of the bearings and caps are faced in the same fixture by means of the bar and cutters shown in Fig. 5. The bar is fed in both directions, the facing cutters having a double edge. The boring of the oil-slinger groove is accomplished by the special tool shown in Fig. 6, the form tool *A* being forced out into cutting position after it reaches its proper location in the end bearing. The smaller diameter of the collar behind the cutter acts as a guide in the bearing while the groove is being cut.

Drilling the oil pan is shown in Fig. 7. It is drilled to match the crankcase in the same fixture as shown in Fig. 3, except that the bushing plate is in the reverse position. By using the same bushing plate for both parts, there is no question as to their going together when assembled.

After assembling the crankcase and oil pan, they are mounted on a mandrel and the ends are faced in a McCabe double-swing lathe, as in Fig. 8, utilizing the largest swing for this purpose.

Just before final assembling, the main bearings are carefully finish bored, as in Fig. 9. A fly cutter is used, being followed by a burnishing tool as at *A*. About 0.0002 to 0.0003 in. is left for the burnishing operation. It will be noted that the studs for holding the cylinder water jackets have been put in place, in order to avoid any possible slight distortion that might come from screwing them in after the bearings have been bored.

When a man feels that he has learned to do his work so well that nobody can show him anything further, he has reached his limit on the ladder of advancement and is paving the way for others to overtake him.

Seen and Heard

By John R. Godfrey

The wrong steel and what it cost

A LITTLE carelessness goes a long way at times. Failure to mark the grade of steel on a bar in such a way as to identify any piece cut from it, may easily cause a lot of trouble. And the cost of such mistakes often mount to amazing proportions. Here's one case that came to notice recently.

A new transmission was being built and a trial order was under way. Because the steel was not properly marked, a bar of low-grade steel was cut up for blanks for a very important gear in the transmission. Gears from this low-grade bar were made up and heat-treated with the others, but the results were naturally far from satisfactory. The transmission started off all right but soon began to give trouble. Examination showed the cause of all the trouble to be with these gears—and the reason became apparent.

Of course the man who supplied the steel was "very sorry" for the error and offered to replace the steel. But the cost of the steel was insignificant in comparison with the other expenses. The labor of making the gears was considerable, since they were not a production job. But greatest of all, the direct costs was the labor of taking out the assemblies after the transmissions had been installed in the trucks, sending them back to the shop for overhaul, tearing them down to replace the defective gears, reassembling and re-installing them in their places —where they were not thrown out completely on account of the trouble.

The greatest cost of all, perhaps, was the loss of confidence on the part of those trying out a new mechanism. It takes more or less nerve to go to the expense of installing a new device, anyhow, and when it doesn't pan out well, the easiest thing is to charge the cost up to experience and forget it. Very few will give it a second trial after a flat failure, no matter what the cause. Wrong steel in the gears isn't very comforting when you think of the cost and the delay. And it makes you suspicious as to other mistakes that may creep in.

The manufacturer has little or no comeback, either. While the firm where the mistake happened is ethically responsible for all the losses incurred as a result, how are you going to be compensated? How can you prove it all—who pays the cost of the trial?

A little carelessness in getting steel mixed up cost a barrel of money in this case. How many shops have methods that absolutely prevent such an occurrence?

June production of motor vehicles in the United States, as reported to the Department of Commerce, was 314,552 of which 274,374 were passenger cars and 40,178 were trucks, as compared with 395,674 passenger cars and trucks in May and 380,372 in June, 1926.

The report is based on figures received from 156 manufacturers in the United States for recent months, 53 making passenger cars and 121 making trucks (18 making both passenger cars and trucks).

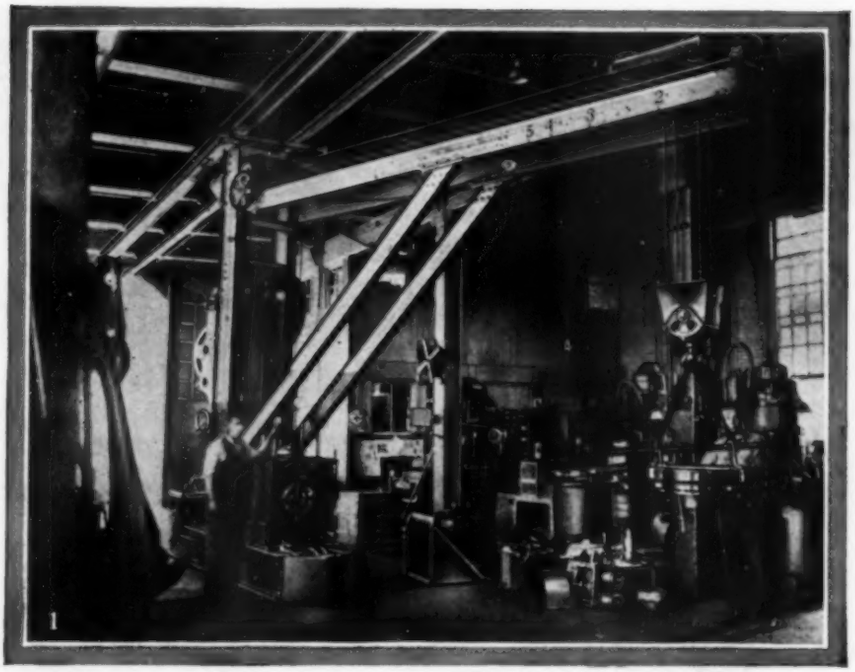
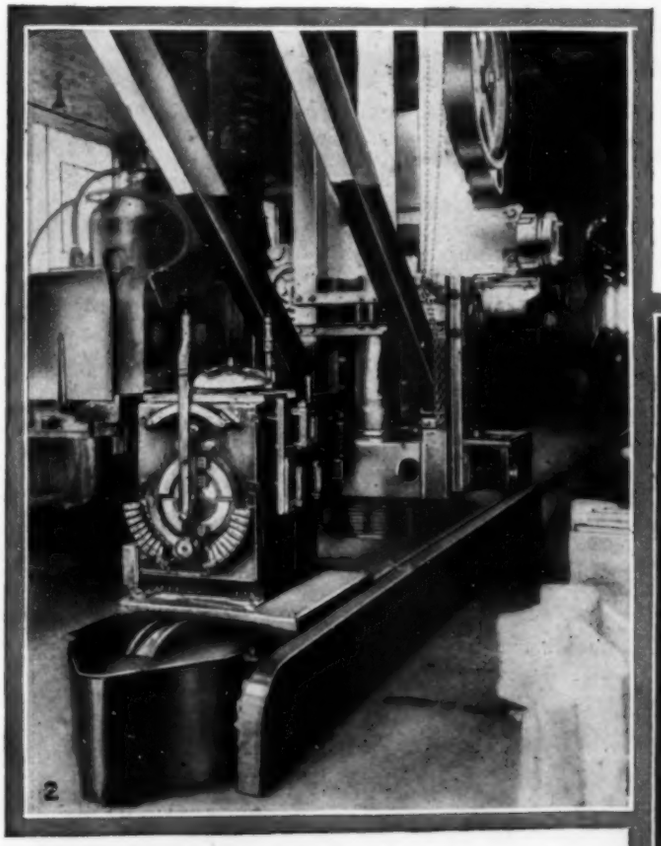


Fig. 1—Crane lifting and transporting a machine table. The numbers on the jib denote the weight of load in tons that can be carried with safety at the various points

Fig. 2—The crane travels on a single rail and is guided by rails overhead. One of the wheels, and the controller for the motor are to be seen at the front

Handling Work with a Walking Crane

Photographs by courtesy of the Blanchard Machine Co., Cambridge, Mass.



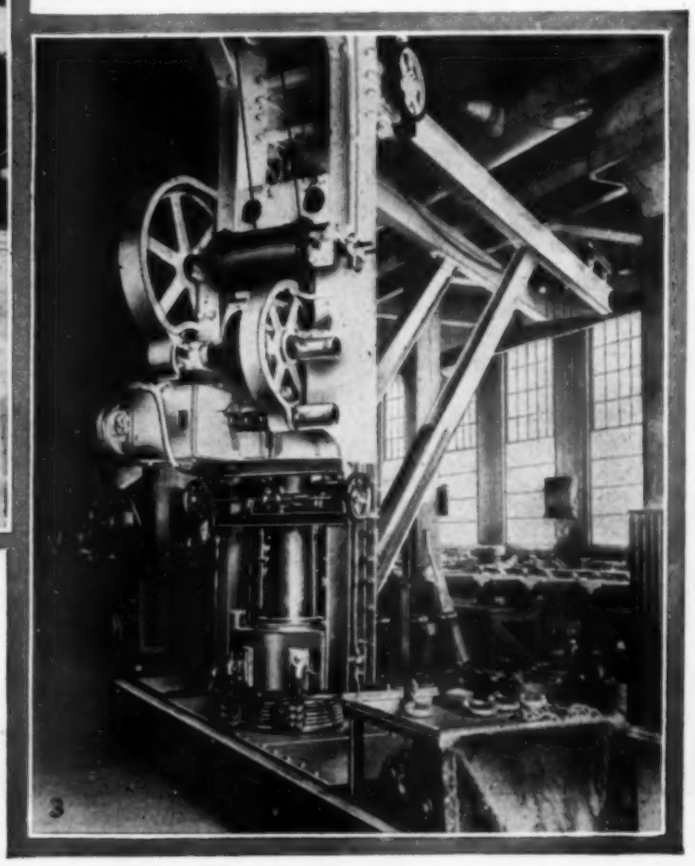


Fig. 3—Mechanism of the hoist and the controller drum can be seen at the back of the column. Current for operating the motors is taken by trolley wheels from overhead wires

LIFT
Handling in the

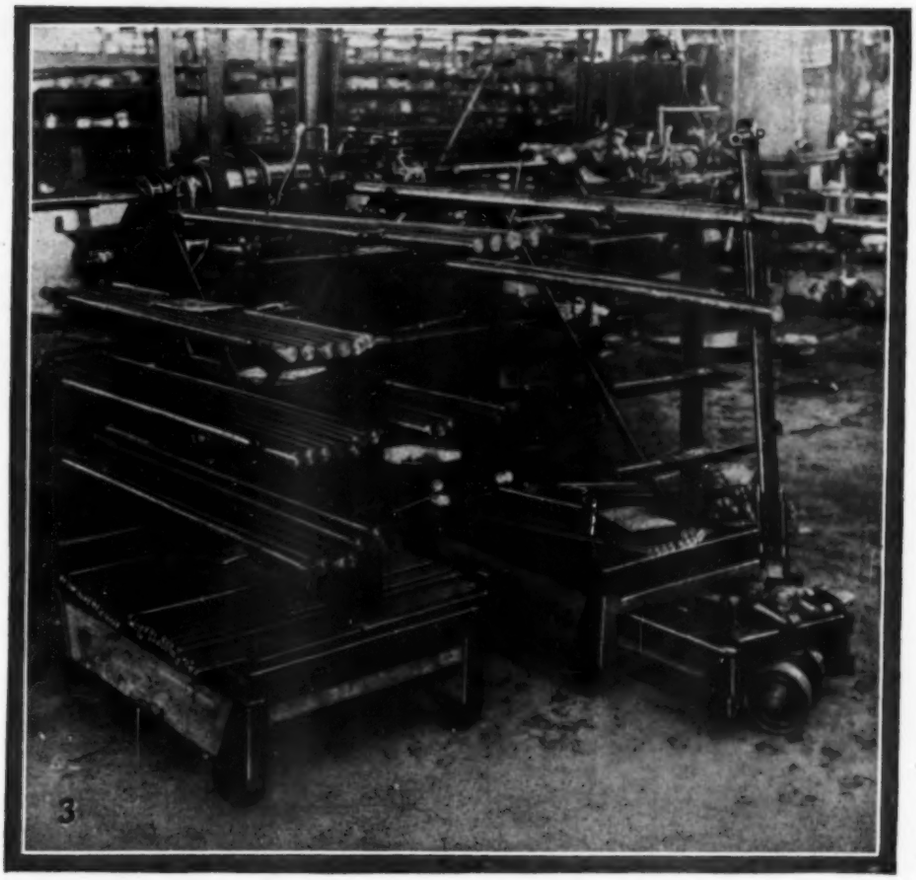
Photographs by courtesy of The Lewis-Shepard Co.

1—Stacker located near door to assist in loading and receiving material by varying platform height

2—Lift-truck train of valve parts on the way from foundry to machine shop saves much handling

TRUCKS *Material Plant*

Photographs by courtesy of The Stuebing Truck Co.



3—Portable racks for carrying short lengths of stock to the machines. These save time and space

4—Parts in nested tote boxes ready for transport to machine or stockroom are easily located

THE · FOREMAN'S · ROUND · TABLE

Refusing to Be a Doormat

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"SAY, Al, I'm mighty glad we don't have a super who is as darned unreasonable as one I heard of the other day. My friend Harry Osborne works in the backshop of the XY Railway,—and his M.M. must be a Tartar.

"What's it all about, Ed?"

"This M.M. bird blows into the shop one morning after a heavy snow and finds the floor around one pit all messed up with water and slush from an engine that had come in for emergency repairs. He bawled Harry out good and proper and wanted to know why he had such a sloppy mess on his floor.

"He finds the yard crew had pushed the engine in long before the shop opened, but he blamed Osborne for not knowing they were going to, and for not having men there to shovel the snow off before it came in. Can you beat that for downright, cussed unreasonableness, Al? Gee, if Williams was that kind of a man I'd be hunting a new job P.D.Q. or sooner."

"Didn't Osborne explain the circumstances, Ed?"

"He tried to, Al. Told him enough so he knew when the engine came in. And then he accused him of blaming the yard crew."

"I knew a somewhat similar case once, Ed. Only the foreman was one of those chaps who just wouldn't be squelched, even if he lost his job. The same kind of an M.M. bawled him out and started to walk away. But the foreman buttonholed him and made him listen. And what he told him was plenty. He called him a big old slave driver and a few other choice names and told him he could have his job if he wanted it."

"But he got fired, of course?"

"No, he didn't—that's the funny part of it. Expected to, of course. But he so completely surprised the M.M. that he forgot to fire him. Perhaps he admired his nerve. But it's a risky thing to do, if you need a job."

"I'll say it is, Al. I'm not trying it on Williams."

Was Osborne wise in letting the M.M. get away with such unjust accusations?

Or would Osborne have lost his job if he hadn't?

How can unreasonable acts be taken higher up?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Keeping Down the Work in Process

I WOULD first stress the importance of keeping the shop equipment in good running order. Proper servicing and maintenance is one of the prime means of reducing the work in process. A broken down machine will tie up the work immediately scheduled for the machine, and will produce a tie-up all along the line. Proper stocking of replacement parts for the wearing units of the shop equipment is essential. Next in importance is the proper planning and scheduling of all work. The most important phase of this is to have all material available and delivered before work is started in the shops. If actual material is lacking in some details, the authorization for substituting available material should be obtained before starting. The next step in keeping down the work in process is a proper "follow-up." Having launched the work successfully, it is important to keep after it and not assume that "no news is good news." Work has a habit of being side-tracked in a busy shop that is astounding to the un-initiated. Daily checks by planning men, rather than by the foreman, who has enough to do with actual shop work, are fundamental requisites. This should be made not only with the thought of the current job in mind, but also with that of the succeeding job schedule for the same equipment. A means for obtaining decisions quickly on work which deviates from the specifications and drawings if they appear in error, should be provided. Quick decisions on "spoiled" work as to whether it must be scrapped or can be salvaged is essential. —B. E. LAMBERT.

I SHOULD say the zero point in stock inventory is represented by the number of pieces that would equal half a day's work on any of the operations. With this number sufficient parts will be on hand to provide for any contingency in the nature of a break down; but at the same time the normal inventory will be greatly reduced.

To add follow-up men merely to reduce the work in process is paying more for the cure than for the disease. At the inauguration of a campaign to reduce the work in process, it may be advantageous to assign temporary follow-up men, who will point out and correct the more glaring examples, and spread the idea. Once properly launched and organized, the additional men should not be required.

Either the time-study man or the planner can best determine economic work-in-process standards. The best procedure would be to have them work together for a starter, the time-study man to get the data from existing jobs, and the planner to apply it to new jobs in the form of a "work-in-process number" to be written on the orders. This number will represent the number of pieces to be forwarded as a unit through the shop. After basic data have been established, this work can be delegated to the planner as a part of his regular routine.

—A. D. KLIGMAN.

THE · NEXT · TOPIC

Solving the Vacation Problem

QUESTION

Is offering a time bonus for regular attendance a solution to the problem of giving shopmen vacations with pay?

Should the Shop Govern Purchases?

EXPERIENCE as a foreman during the last 25 years in various plants leads me to state that too many firms permit their purchasing departments to designate the class of materials to be bought, instead of getting the information from the production shops. This is particularly true in plants where sheet metals are used. It is absolutely necessary if the maximum results are to be obtained in the sheet metal fabrication shop, when ordering sheet metals, to designate the temper desired, whether dead flat, open-annealed, and the finish. It is desirable also to specify the sizes best adapted to the purpose for which they are to be used, thereby eliminating unnecessary waste of material. Power press operators know the absolute importance of acquiring material that is just right. Sheet brass for example, that is too hard will crack under the strain of drawing or forming operations. If the temper is too soft the surface will be porous, and it will be difficult to obtain a good surface in polishing. Wrong mixture or wrong gage can make an entire shipment worthless for its purpose. My answer is no to the question "does money saved in the purchase of materials always stay saved in the shop?" because I have on very many occasions seen material, that was obtained by the purchasing department at a little less cost than that which suitable material could have been obtained, become worthless for its intended use during the fabricating process. Unfortunately, many purchasing departments have not the practical knowledge gained from shop experience with the result that they frequently designate and obtain wrong material. —E. ANDREWS, *Foreman, England.*

I THINK Ed's grouch was quite justified. The requirements relative to the quantity and quality of any metal article made in the shops are found out during the process of manufacture, upon these we depend for successful manufacturing. Once a material is found to fulfill the requirements stated, it should be the duty of all foremen to see that the purchasing agent is supplied with a complete analytical specification of the material, which should govern all future purchases, and no deviation from this formula should be allowed without first consulting the shops. —C. L. HENRY, *England.*

Consulting the Foreman on Tool Design

WHY shouldn't the foreman be consulted? He is responsible for the efficiency of his machines, and he should have all new designs submitted for his approval. Time and time again "new ideas" are tried which are nothing more than old rejected ones. The foreman is the man who will catch them and save the cost of making up new fixtures that might be junked.

In the job shop where most of the men are first-class machinists and have some knowledge of reading blueprints, it would be well to present the design to the men who are working on the type of machine for which it is intended, but in the production shop it would not avail much to ask the machine operator to criticize the design because generally he is an unskilled or semi-skilled man, and the design is nothing but lines and figures to him.

—BENJ. C. THOMAS.

LARGE amounts of money have been wasted because the designer was not familiar with the small peculiarities of the machine on which the tool was to be used. It should not hurt the designer's dignity to discuss his designs with the foreman and the man who is going to use the tool. In fact, he will most likely get a few practical pointers that will be beneficial to him. Designers of tools and fixtures, for example, are very apt to overlook the fact that chips must have plenty of room to curl up and work out. Making proper provision for such things saves a great amount of trouble.

—ERIC HAWTHORNE.

I BELIEVE it would be better not to ask the foreman to sign the sketch, but to depend entirely upon his good faith in the circumstances. To sign the sketch may make him a little wary about advancing his best ideas for fear that while they are unconventional and radical, they may be accepted on his signature, and he may be held to account if they don't "pan out" exactly right. After all, the responsibility is the designer's.

The calling in of the workman who is to use the proposed design should be purely at the option of the foreman. If the foreman believes the workman can contribute sufficiently worth-while thoughts on the matter, he will undoubtedly consult him. In no instance, however, should the workman be asked to sign the drawing, as this infringes on the foreman's authority, and might cause the workman to take himself too seriously as a consultant.

—EARL U. RAMSDEN.

Getting New Blood in the Shop

LET business lack dividends and the cry goes up from the stockholders, "put new blood in the shop." And often the good old standbys are set out on the sidewalk and their places filled by "new blood." There are no statistics showing whether the new blood is any better than the old, but I could cite some cases where it has gone down to bankruptcy.

Stagnation has no certain connection with age or length or service. One shop of quite some size is dominated by young men, under forty at least, who are a hundred years old in their mental activities. Another shop until his recent death was dominated by a young fellow who was born eighty years ago, but never wholly grew up.

The things that stand out large in the machine tool industry in the thirty or forty years of my acquaintance are the gear shaper, gear hobber, the flat turret lathe, and the plain grinder. At the moment it seems to me that everything else has come about merely through evolution of what already was; but was it necessary to bring young, new blood into the industry to secure these improvements? Not unless my memory fails me.

—ENTROPY.

NEW blood is not necessarily bad blood, nor old blood, good blood. Take it all round, it is better to encourage those who improve themselves and are able to maintain freshness of outlook and firm grip upon the reins. The tendency and the temptation for those who stick in the one plant, however, is to become almost unconsciously and by slow degrees, mere "stick in the muds." Often, too great length of service with one company is accompanied by slackening in initiative and zeal. The old stagers are seldom outstanding in originality. Thus, it may be, when chance for promotion comes, there is no one of sufficient distinction to fill the new post. Unless one of the men has acknowledged qualifications, friction, jealousy and discontent may be the result of such a promotion. "Give the man on the job a chance if he's worth it" is a good motto. Otherwise the outsider may be the only sensible alternative.

—W. R. NEEDHAM, *England.*

Abolishing Private "Mikes"

FROM the workman's standpoint, the company should furnish the "mikes" and other measuring tools, as he feels that he should not be required to wear out his own instruments on production. From the company's viewpoint it is a very unsatisfactory thing to furnish commercial measuring instruments to men on production, as they are more apt to be careless with a company article which they do not have to pay for. It seems to me that a satisfactory arrangement could be worked out that would be fair to both employer and employee, by numbering and making the employee responsible for the tools in his possession. In this way a regular check up could be made. —O. W. COOPER, *Acting Chief Draftsman.*

I WOULD hold the foreman responsible for Bill's work being too large. He should check the first unit of a large production run, as well as a new man's equipment when he reports for work. Had he done either of these, the trouble would have been detected before the damage was done.

Generally new men come on the job during a rush period. As a consequence, the foreman is inclined to get them a long production job so he won't have to be bothered with them while he attends to his many other duties. But, a little time spent with the new man, getting him properly launched and familiarized with the shop's equipment, routine and rules, would be time spent to advantage. Half-done tasks have a habit of bobbing up, and it can't be denied that foremen often fail to inform men of shop facilities; particularly if the foreman himself has been with the company a number of years.

—JAMES P. KEATING.

Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upward, depending upon their merit.

Fixture to Hold Taper-Shank Reamers—Discussion

By Matthew Harris

Referring to the article by Jack Williams, under the title given above, on page 67, Vol. 67, of the *American Machinist,* I can tell him how to add another feature to the fixture he described, and at very little cost.

A pan partly filled with oil or cutting compound, if placed on the machine table under the cutters, and at the proper height to allow the cutters to dip into the contents, will automatically supply lubricant, or coolant, to the cutters and the work.

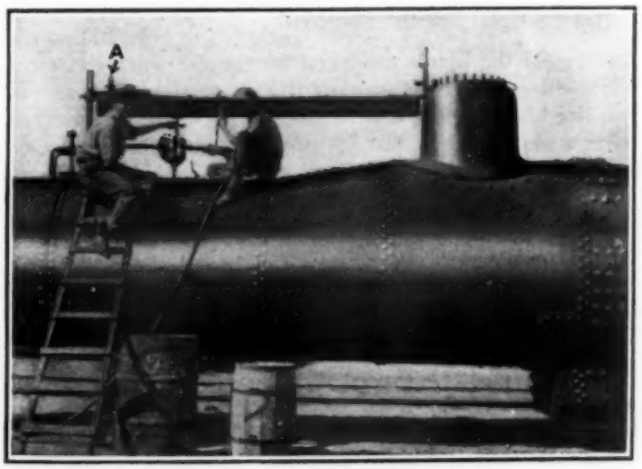
If Mr. Williams will look on page 231, Vol. 51, of the *American Machinist,* he will find that I there described a fixture substantially the same in principle as the one he proposes, with the additional feature for automatic lubrication of the cutters and the work.

A Husky "Old Man"

By Frank C. Hudson

I have seen many sizes, shapes and varieties of "old men" used in shops in various localities, but none that equalled the "old man" illustrated for general huskiness and convenience on this particular job. Finding it necessary to drill out a line of rivets in the upper seam of the boiler, the "old man" shown was improvised from a heavy piece of timber supported at each end.

The left-hand support is a standard type of "old man," wtih its base clamped to the boiler by a large C-clamp that goes through the opening for the smoke stack. The end of the timber is fastened to the upper arm by means of a U-bolt as at *A*. The other end of the timber is held by studs in the steam dome by two angles bent up in the blacksmith shop.



A convenient "old man"

With the timber thus supported it is an easy matter to move the air drill to any desired point lengthwise of the boiler. By using a small piece of boiler plate between the upper end of the air drill and the timber, the wooden beam answers just as well as though it were metal.

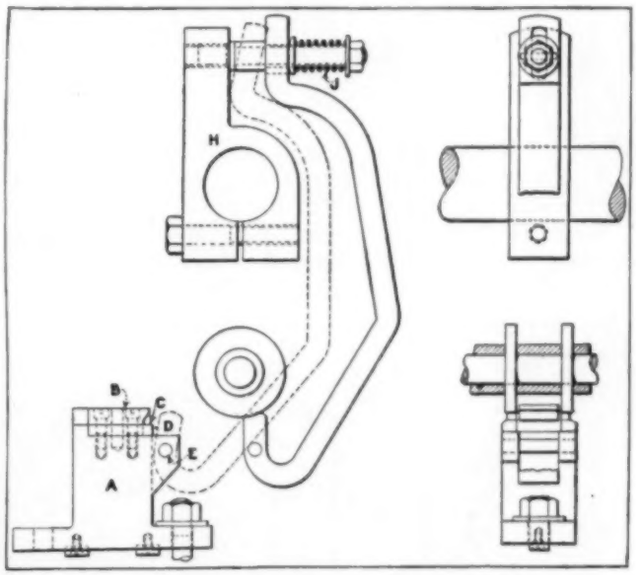
An Automatic Clamping Fixture

By D. Baker

We recently had an order to make a large quantity of very small shafts, to be turned down to ¼ in. diameter for a length of ⅛ in. at the ends, and to have flats milled on the reduced portions. The turning was an easy matter and need not be taken up here.

For the milling operation, we made a fixture to hold ten of the shafts, but discarded it because it was difficult to hold all of the shafts with the same degree of tightness.

We then made the self-clamping fixture shown in the illustration, and, while it held but one shaft at a time,



Fixture that clamps the work automatically

the production was greater than that by the multiple fixture.

The body *A* of the fixture is a block of machine steel. Part *B* is hardened and has serrations at the end against which the shafts are clamped. The locating block *C*, also

hardened, has a pocket to receive the shafts and to confine them by the shoulders against end movement. The clamping lever *D* is pivoted to the body of the fixture by the pin *E*, and extends upward above the overarm of the milling machine. Its upper end fits loosely on a stud in the block *H*, attached to the overarm, and is kept under pressure in one direction by the coil spring *J*.

In operation, when the machine table is moved to the left, the upper part of lever *D* strikes the block *H*, causing the upturned end above the pivot to move to the right, thus giving space enough to insert a shaft in the locating block. Moving the table to the right reverses the process, and causes the short end of lever to force the shaft against the serrated end of the clamping block. Since the clamping leverage is about 12 to 1, the pressure exerted by the spring *J*, is ample to cause the short end of the lever to clamp the shaft while it is being milled.

Press Tools for Making Radio Indicators

By Atol Maker

The press tools for making arrow-head indicators such as the one at *A*, Fig. 1, mounted on the panel of a radio set, are shown in the illustrations. The indicators were blanked from brass stock 0.025 thick, and, in addition to being bent and folded as at *B*, fine V-shaped notches were cut in the shanks to serve as threads for knurled nuts, as at *C*, by which they were to be attached to the panels of the instruments. In the enlarged view in Fig. 2, the notches in one of the shanks are shown.

In Fig. 3, the blanking tools are illustrated. The die *A* is made in two parts, and is seated in the die-block *B*. In the blanking operation, the notches to serve as screw threads are cut into the shank. For making the bends and folds, the tools shown in Fig. 4 were used. In this illustration the tools are shown in section at *A*, while *B* and *C*, respectively, are plan views of the die and punch.

In operation, a blank is placed in the nest, which is a fit for the thread notches, and is held by the spring plunger *E*, while bending takes place. After bending, the piece is placed in the slot *H*, and the fold is closed tightly as at *J*, when the ram is at the bottom of its stroke. The fold in one piece is closed at the same time that another piece is being bent, thus the two operations are completed at one stroke of the press.

Some of the methods used in making the blanking die may be of interest, especially the portion for producing the thread notches on the indicator shanks. This

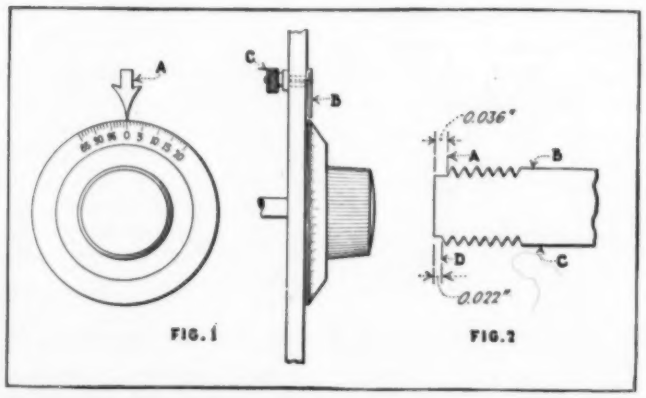


Fig. 1—The indicator in place. Fig. 2—Enlarged view of threaded shank

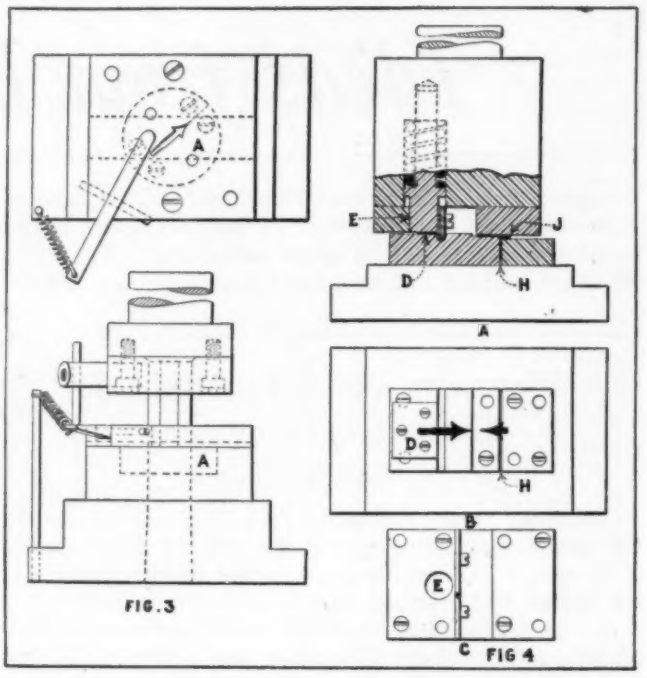


Fig. 3—The blanking tools. Fig. 4—The bending and closing tools

part was milled by a cutter made so as to obtain the dimension 0.036 in. on the shank, as at *A*, Fig. 2. After milling the die section for threading the side of the blank at *B*, the width of the cutter was reduced 0.014 in., the stock being ground from the end *A*, Fig. 5. Then the section of the die for threading the side of the blank *C*, Fig. 2, was milled, setting the end of the cutter to the same position as in milling the previous section, and obtaining the dimension 0.022 at *D*. This procedure made the threaded portions of the die one-half of the pitch out of step with each other. Thus the notches on the blank produced by the die were the same as the threads on a thin, lengthwise section of a screw, produced by slabbing off the sides. Of course, the threads were without helix, but its absence was not noticeable in so thin a section.

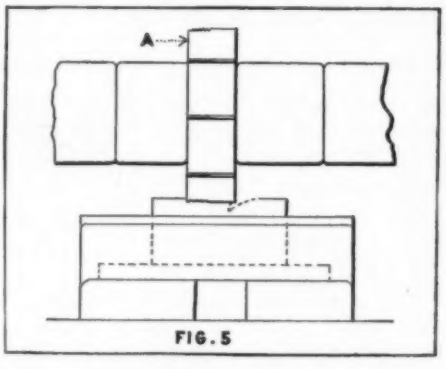


Fig. 5—Milling threads in the blanking die

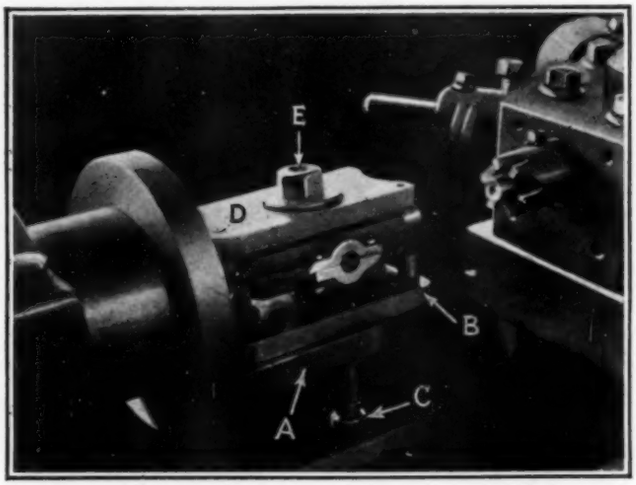
Upon completion of the thread milling, the arrow-head portion of the die sections was filed to shape, and the sections were screwed and doweled to a plate mounted in a lathe. The sections, which were rectangular, were turned to fit the round seat in the die-block.

Indexing Fixture for Screw Machine

By J. W. Kraigenow

The illustration shows a fixture, designed to screw on the spindle nose of a hand-operated screw machine, by

means of which four operations may be completed on a single piece of work without other adjustment than indexing between cuts. Though the part to be operated upon consists of two pieces it has been assembled into a permanent unit before it reaches this stage. The operation comprises drilling reaming and hollow-milling trunnions, one at each end of the part, and drilling and reaming holes for bearings at each side.



Indexing fixture for screw machine

Plate *A* is permanently a part of the faceplate. Plate *B*, mounted to swivel upon a stud that is secured in plate *A*, may be turned clear around, and may be locked by the spring-actuated indexing pin *C* in any one of four positions. Permanent V-blocks and studs in plate *B*, shaped to fit the work-piece, serve to locate it in the fixture, and it is secured by plate *D* and nut *E* against shifting its position.

The tools for the various operations are carried in the turret of the machine in the usual manner. The piece is symmetrical, so that but two sets of tools are needed to complete the four operations, and can, therefore, easily be accommodated in the hexagon turret. The operation may begin at any station of the fixture, and the operator has only to index the fixture and turret to corresponding positions.

Compiled Figures Show the Cost of Leaks

By George H. Feltner

To exemplify the loss in actual money, so that department foremen and workmen can see at a glance the waste set-up by defective connections, led the Fort Worth & Denver City Railway Co. to compile a sheet that shows the comparative costs of steam, air and water leaks.

Table I—Steam Leaks

Size of Leak Diam. in Inches	Cost of Leak per Month 60 Lb.	120 Lb.	150 Lb.	200 Lb.
1/16	$2.98	$5.26	$6.44	$8.24
1/8	11.86	21.02	35.74	33.00
1/4	57.46	84.04	102.96	132.02
1/2	189.90	336.10	411.86	528.08
3/4	427.50	756.10	926.50	1,187.96
1	759.62	1,344.44	1,647.44	2,112.34

Table II—Air Leaks

Size of Leak Diam. in Inches	Cost of Leak per Month 100-Lb. Pressure
1/16	$5.78
1/8	23.18
1/4	92.72
1/2	370.90
3/4	835.00
1	1,438.64

Table III—Water Leaks

Size of Leak, Diam. in Inches	Cost of Leak per Month, 100-Lb. Pressure
1/16	$12.00
1/8	48.00
1/4	192.00
1/2	768.00
3/4	822.00
1	3,072.00

The figures are computed on a basis of fuel at $8 per ton, and water at $0.08 per thousand gal. The figures, shown herewith, include the size of the leak and the monthly cost.

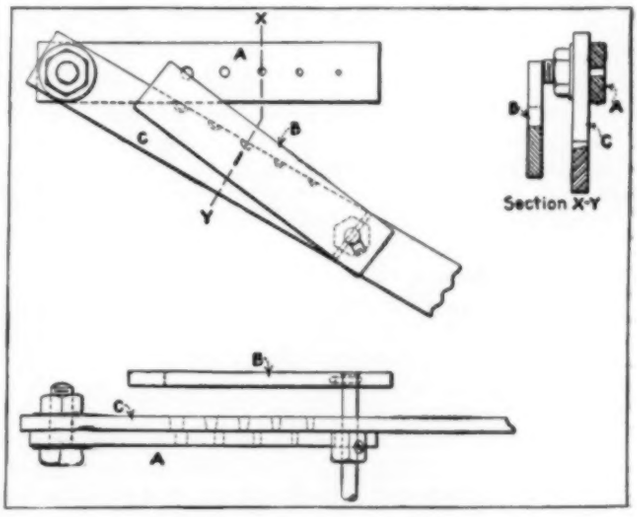
Since the figures have been arranged in tabular form, thus giving the shop executive a chance to see what a leak really costs, there has been a greater tendency to check leaks as soon as they are detected, resulting in an ultimate saving in overhead.

Gage Attachment for a Chisel—Discussion

By M. Fred Klingenstein

In an article under the title given above, published on page 790, Vol. 66, of the *American Machinist*, Arthur Kendall describes a method of cutting off pins of small diameter to a given length, from rods.

In reading the article, I was reminded of a device I made some years ago for the same purpose. The device, shown in the illustration, is made of tool steel and is intended to be held in a bench vise. It has a shearing



Device for cutting off pins

action, and by its use a boy can cut from 750 to 1,000 pins per hour.

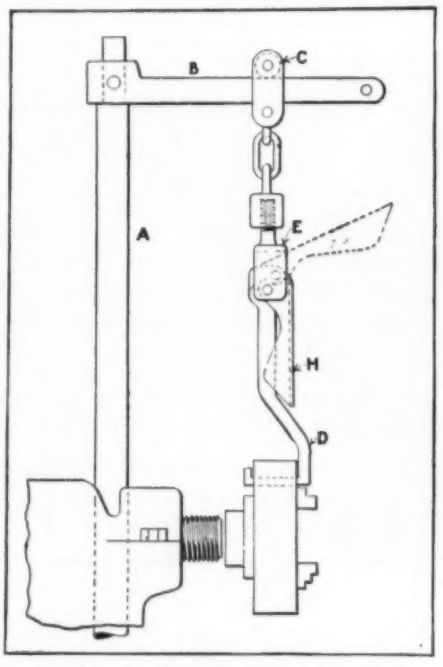
Part *A* has a series of holes for various sizes of rods, through one of which the rod to be cut is fed upwards. Part *B* is an adjustable stop to govern the length of the pins. Part *C* is pivoted to part *A* and is provided with half-round notches in line with the holes in part *A*. The notches are ground with the necessary clearance to make a clean shear.

In operation, the part *A* is held in the vise and the gage *B* is adjusted for the length of the pin to be cut and swung partly over the hole through which the rod is fed. The rod is pushed up against the stop, and part *A* is pushed forward, cutting off the pin. Owing to the sharp edges of the holes and the notches, and the close fit between parts *A* and *C*, the pins are cut off without bending them and with very little deformation of the ends. Part *A* can be any length desired to give proper leverage, and can be fitted with a handle to make the work easy on the hand.

Device for Removing Lathe Chucks

By J. H. Hahn

The drawing shows a handy device for removing lathe chucks and for holding them while not in use. The vertical part *A* is a pipe attached to the floor, back of the lathe. The arm *B* is pinned to a piece of round steel of a size to fit freely within the pipe. The traveler *C* runs on the arm and supports the hook *D*, through the adjustable clevis *E*. In operation, after the clevis has been adjusted to bring the hook to the proper height, the chuck is started off of the thread of the spindle nose, and the hook is placed through one of the holes in the chuck body, while the lever *H* is in the position shown by the dotted lines. Depressing the lever *H* so that it rests against the shank of the hook, raises the hook to its highest position and takes the weight of the chuck from the spindle. The spindle can then be unscrewed from the chuck by running it backward.



Device for handling and holding lathe chucks

When the chuck is free from the spindle there is no tendency for it to drop, because the pins connecting the lever with the hook and clevis will be in such position that the weight of the chuck will hold the lever against the shank of the hook. The chuck can then be swung out of the way by turning the arm. In putting the chuck on the spindle the process is reversed.

Tool-Repair Bulletin Board

By Lewis H. Kenney

A bulletin board that indicates the locations of machine tools in a shop, shows at a glance the tools out of service, and describes the character of the repairs required to place them in operating condition, was developed by, and is in use in the office of, George J. Costello, master machinist, Navy Yard, Philadelphia.

In Fig. 1 is shown the bulletin board with the floor plans of the shop marked thereon. White circles placed around sockets set in the board indicate the locations of the tools. Below each circle is the tool designation, such as "LE-44," indicating Engine Lathe No. 44, and so on. A tabular form is provided with columns headed:

Description of machine. Part broken. Date of break.

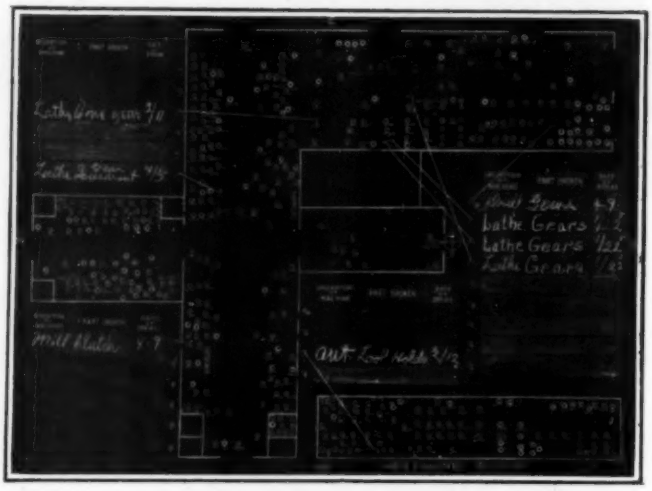


Fig. 1—The tool-repair board

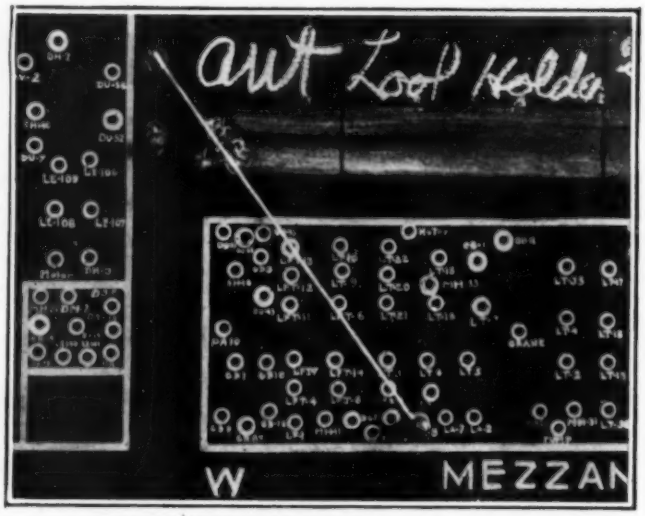


Fig. 2—Close-up view of part of the board

At one end of each line of the tabular form is an indicating pin in a socket set in the board. Attached to the pin is a cord that passes through the socket to a counterweight at the back of the board.

When a report is received that a machine tool is out of service, together with a description of the repairs required, an entry is made on a line of the tabular form and the indicating pin is placed in the tool socket as shown in the close-up view, Fig. 2. The cord serves to direct the eye from the tool to the tabular form.

Characteristics of Phono Bronzes

Phono bronzes are alloys, high in copper, containing small amounts of tin, approximately 1¼ per cent, and fluxed with silicon. Their outstanding properties are in their abilitiy to be hot-worked, and to be strengthened by cold work to a high degree without losing their toughness or becoming brittle. They do not season-crack. Consisting largely of copper, they maintain the latter's resistance to corrosion, and most of its electrical conductivity; unlike copper, which normally contains considerable cuprous oxide, the Phono alloys are deoxidized, and are consequently tougher.

These alloys are available in the form of rod, sheet, tube, and wire, for uses where high strength, toughness, resistance to corrosion and wear, hardness, and high electrical conductivity are needed. They can be machined, drawn, cupped, upset, hot- and cold-forged, soldered, brazed, and electro-plated. Phono alloys can be hot-rolled and hot-forged with ease at temperatures from 700 to 800 deg. C. The results are moderately soft, very tough, and ductile materials. They can be cold-rolled, or drawn without intermediate anneals. While not "free-cutting," phono alloys can be machined when tools with sufficient clearance and rake are used.

The Phono alloys are readily annealed, and softness and ductility obtained by annealing at temperatures from 500 to 600 deg. C. Only a slight increase of softness is obtained at temperatures higher than this. A correspondingly increased grain size and a rough surface after forming, without any material increase in ductility, are obtained if high temperatures are used. The high strength of hard-worked Phono alloys is lost by annealing at temperatures over 300 deg. C., as copper softens at about 250 deg. C. As a result, care should be taken in soldering and other operations needing heat not to exceed this temperature if the maximum strength is required. The Phono alloys are readily pickled in 5 to 15 per cent sulphuric acid, either hot or cold.

Soldering, brazing, and welding can be performed just as on copper or other bronzes. The coefficients of expansion of the Phono alloys are practically the same as that of copper. Therefore, composite cable can be made having both copper and Phono strands. It has frequently been found that needed strength in a given installation can be obtained with smaller-size Phono at less cost than can be obtained with larger copper at higher cost.

The alloys are supplied in three different groups: Phono Hi-Strength, in which increased strength has been secured at the expense of electrical conductivity, and which is fitted for many mechanical uses; Phono Hi-Con, in which electrical conductivity has been secured with corresponding decrease in tensile strength; and Phono Electric, used chiefly for trolley wires of high tensile strength, toughness, and exceptional corrosion-resisting properties. The accompanying table gives the properties of these three alloys.

Physical Properties of Phono Bronzes

	Phono Hi-Strength	Phono-Hi-Con	Phono-Electric
Tensile strength, lb. per sq.in....	42,000–125,000	38,000–80,000	40,000–90,000
Elongation in 10-in., per cent...	40–1	40–1	40–1
Reduction in area, per cent.	70–50	70–50	70–50
Specific gravity.	8.78	8.92	8.93
Electrical conductivity, per cent (copper = 100).....	13	75	45

The wide range indicated for tensile strength and elongation is due to the variety of conditions in which the alloys can be produced. In the hot-rolled or hot-forged condition, Phono-Electric has a tensile strength of 43,000 lb. per sq.in., and an elongation of 35 per cent. When thoroughly annealed, it has a tensile strength of 40,000 lb. per sq.in., and an elongation of 40 per cent. When cold-drawn to about 35 per cent, it is suitable for making bolts by cold heading, and has a tensile strength of 55,000 lb. per sq.in. When drawn for trolley wire, it has a tensile strength of 75,000 lb. per sq.in., and an elongation of 3 per cent. When drawn extra hard, it has its maximum strength of 90,000 lb. per sq.in. Under any of these treatments all of the Phono alloys maintain their toughness as measured by their ability to be bent and twisted.

For the information given we are indebted to the Bridgeport Brass Co.

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Technical Abstracts

Abrasives Finish Machine Ways

The grinding of machine tool ways, or flat bearings, is no longer in the experimental stage; it is an established and appreciated fact. Way grinding is, however, a finishing process, intended to replace scraping, and nothing else. It is not intended to do away with milling or planing, the quality of which operations remains a factor quite as influential as in scraping, but it is quite possible to remove as much as 0.012 in. of material by grinding, with marked advantage in point of time over scraping.

It must be understood that where great accuracy is required, the built-in accuracy of the grinding machine must be even greater than that desired for the work in order to be sure of results. This implies not only extreme refinement in the manufacturing methods of the grinding machine maker, but also very sensitive means of alignment of the machine for all cardinal positions as well as for setting the grinding wheel to very fine increments.

Wheels used in way grinding must be porous, soft to medium grade, fairly close grain, and they must hold their size well on finishing cuts.—L. Sichel, *Abrasive Industry*, July.

Skin Troubles from Cutting Oils

Machinists exposed to contact with cutting oils and emulsions frequently suffer from troublesome skin diseases affecting hairy portions of the hands and arms. Whether cutting oils in themselves have any irritating action on the human skin has long been a disputed question, but it has been found that mineral oils treated with sulphuric acid have certain chemical ingredients which lodge in the pores and hair pockets and irritate the lining cells. These chemical irritants are believed to be an important cause of inflammation. Animal and vegetable oils used in compounding frequently have a high percentage of free fatty acids, which are likewise irritating to the human skin. The cheaper grades of lard oil, for instance, may contain from 15 to 35 per cent of free fatty acids.

Cutting oils are generally free from germs when received by the purchaser, because most manufacturers make it a practice to sterilize these preparations. It is exceedingly difficult, however, to prevent germs from getting into the oil when it is being used in the shop. While cutting oils and compounds are often blamed for almost every kind of skin infection which occurs amongst machinists, it appears to be true that more frequently the germs responsible for the condition come from sources other than the oil.

Cutting oils which are used more than once should be filtered and sterilized, preferably each time they are used. Filtering removes the fine metal particles that cause irritation, and sterilization kills all disease-producing germs. The best method of sterilizing the cutting oil is to heat it to a temperature of 140 to 180 deg. F. for a period of 25 minutes to one hour. Experiments have proven that germicides cannot be relied upon to keep the cutting fluid in safe condition. The trouble with most disinfectants is that if used in sufficiently strong solutions to be effective, they interfere with the lubricating properties of the oil or irritate the skin of the worker.

It is hardly possible to over-estimate the importance of personal cleanliness as a means of preventing skin troubles from cutting oils. By frequent and thorough cleansing of the hands and arms with soap, brush, and hot water, employees can prevent the accumulation of oil and dirt in the skin pores, and thus forestall inflammation. Haphazard washing and rinsing of the hands, as practiced by most workmen, is not sufficient. In spite of anything the management may do to keep the oil clean and in a safe condition, workmen will continue to have skin troubles as long as they are permitted to be careless in the manner in which they wash.—*Safe Practices, Pamphlet No. 44*, National Safety Council.

Fifty Years of German Patents

The German Imperial Patent Bureau celebrates this year its golden jubilee. Patent privileges have been issued for several centuries, the earliest German privilege having been issued in the year 1564 by Prince August of Saxony. The English Patent Law of 1623, however, is the one on which present day patent legislation is grounded. The English example was followed in 1762 by France, and in 1790 by the United States. In Germany politics prevented the development of patent laws, but the separate industrial states had legislation dating from as early as 1794. In 1876 an investigation covering the whole empire was begun, and on the basis of this study a patent law was passed on Feb. 24, 1877, and the patent office began operation on July 1, 1877.

In the first year of operation, 3,212 patents were applied for, and 190 were issue. With the exception of the war years this number increased constantly until 1925, when 64,910 patents were applied for, and 15,877 issued. A slightly smaller number were handled during the year 1926, when only 15,500 patents were issued. The total number of patents applied for during the fifty years of operation amounted to 1,339,065, and the total number of patents issued was 439,087. During the war years an average of only a little over 7,000 patents were issued annually.—Dr. B. Rosing, *V.D.I.*, Berlin, June 25.

The Small Foundry

Along certain lines the mass production foundries designed to handle a large tonnage of duplicate castings fulfill a necessary function in the general scheme of manufacturing. The margin of profit on each casting is small, but in the aggregate it is large enough to carry the overhead and pay dividends. A small foundry cannot compete with these giants on a price basis, but a sufficient volume of miscellaneous castings always will be required, and the function of the small foundry is to supply these castings at a price that will yield a profit. Many small foundries are making money for their owners. These foundries are managed by up-to-date men who know their business, and who know their costs.

Large manufacturing companies often operate gray iron foundries to supply their own needs. At times they have been forced to do this through competitive demand which has limited deliveries. In times of general prosperity such iron departments of large institutions may be operated profitably. When demand slackens and when the production of the company operating a foundry is reduced to 50 or 60 per cent of capacity, the mounting overhead forces the foundry to close.

In 1914 there were 5,942 gray iron foundries in the United States, while today there are only 5,785, a decrease of 157, but the production of foundry iron has increased 18 per cent in that time. Explanations of this may be found in the increased production per man and per unit of equipment, and in the consolidation of units.

Merchandising is a feature on which the average foundryman is notoriously weak. He knows that the problem of production is one that he can whip quickly, but if you ask him if he knows where or how he can sell a sufficient number of castings to step up his rate of plant operation to 100 per cent, he will confess that he has not the faintest idea. Ability to estimate the weight of castings from a blue print or pattern should be essential on the part of a foundryman, but the ignorance which prevails in this line is astonishing. In many cases the men know the method, but they hate the effort involved, and they guess at the weight. At the Syracuse convention, the weight of a 109-lb. casting was estimated by 997 foundrymen. The average estimate was 178

lb., and only three estimates came close to the correct weight.

Foundrymen often complain they have nothing to demonstrate in their prosaic product, but the successful foundries have used sections of castings to show perfection of finish, accuracy of dimensions, regularity or other points worthy of the buyer's attention. The foundryman has not had sufficient faith in his own product to fight for it, sell it, and keep it sold. Knowledge of what the customer wants can be turned to advantage by the foundryman. The small foundry occupies a well defined and necessary place in the industrial field. But the field is highly competitive, and is no place for the lazy, the incompetent, or the visionary. To make a success today, a foundryman must be a man of action.—Pat Dwyer, *Industrial Management*, July.

The Anodic Oxidation Treatment of Duralumin

In order for duralumin to be of greatest service to the aircraft industry, suitable means for protecting the metal against corrosion must be found. Unfortunately, electroplating aluminum alloys is exceedingly difficult, and the results, as far as preventing corrosion is concerned, are disappointing. Perhaps the most successful protection to date is the anodic oxidation treatment by electrochemical means, as developed first in England.

The anodic oxidation treatment for aluminum alloys consists of oxidizing the surface of the part by making it the anode in a chromic acid solution through which electric current is directed. This results in a small loss in weight, due apparently to the loss of some of the base metal. The film produced is very thin and adheres to the base metal so firmly that it may be considered as one piece. This treatment removes the polished surface ordinarily seen on rolled duralumin, and gives the material a light gray, velvety appearance. This treatment renders the aluminum alloy very resistant to corrosive influences, but the full benefit of this type of oxidized surface is only secured by the use of a final paint or varnish finish. A number of specimens so treated have withstood the action of a salt spray for ninety days without any material corrosion, whereas similar sheets without the anodic treatment were so badly affected as to be useless as far as strength was concerned. This treatment benefits both annealed and heat-treated duralumin.

Lanoline, rust-preventive compounds, greases, varnishes and paints can all be used effectively on anodically treated parts. The first three can only be regarded as temporary protection, whereas varnishes and paints are permanent. When the metal leaves the bath, is rinsed and then dried, the surface is very clean and in an ideal condition to apply paint or varnishes. If the coat is not applied at this time, additional cleaning will be necessary and the cost increased.

A high first cost for proper and efficient equipment results in low operating cost per unit area of material oxidized, while low first cost with inadequate equipment gives a high operating cost. With most units, considering the size of material being used in aircraft, the cost of anodic oxidation should not exceed a few cents per square foot, or perhaps double that figure per pound. — Lieutenant-Commander William Nelson, U.S.N., *Aviation*, June 13.

Another Angle of the Hot-Box Problem

Hot boxes have been a sufficiently important factor in train operation so that the attention of both operating and mechanical men has at times been largely directed toward the elimination of costly delays resulting from them. Another phase of the hot-box problem, however, is that a hot box on a locomotive truck axle or a car axle may develop a temperature high enough to affect seriously the physical structure of the metal at the journal bearing. Heat generated as the result of a hot box raises the temperature of the metal in the axle at the bearing to a point considerably above that of the adjoining metal. This heat is dissipated somewhat by the volume of cooler metal in the wheel hub and axle, but in the process of distribution stresses are set up in the axle at the point of greatest stress. If all axles that have been subjected to the detrimental effect of hot boxes were immediately removed from service and annealed, many axle failures might be averted. Some roads even go so far as to scrap the axles that have been overheated as a result of hot boxes. A hot box is serious in itself, but a derailment due to a broken axle constitutes an operating hazard that should be eliminated.—*Railway Age*, July 16.

Servicing Machine Tools

"Please send service man immediately. Wire reply." Thus read many telegrams received by machine tool manufacturers, and with the thought in mind that his competitor readily complies with such requests the manufacturer despatches a service man at the earliest possible moment.

The cost of sending out high-grade mechanics in response to such demands is mounting higher every year. Mysterious troubles that upon investigation are found to be easily remedied by a simple adjustment are constantly adding to the "trouble man's" expense account.

Who pays the bills? Under present conditions the customer will not, and if the slightest hint is given that he may be expected to do so he will intimate something about diverting future business to other channels.

The automotive industry probably expects more free service than any other, regardless of the length of time a machine has been used. Apparently without concern as to whether the trouble is due to a fault of the machine or to careless and incompetent operators the user insists upon having the manufacturer put everything right, and does not expect to pay for the service.

It is the firm belief of many in the machine tool industry that the machine tool builder should set a time limit during which free service will be rendered, and make a definite statement to that effect at the time the sale is made. If the automotive industry has been able to build up a successful business under this policy why should not the machine tool builder apply the same principle to his product? The question deserves the careful attention of every machine tool maker.—*Machinery*, July.

Plant Welder Fabricates Sheet Nichrome

A plant manufacturing automobile parts specializes in gears that require a precise heat-treatment, accomplished by means of an electric furnace. It is necessary during and after this operation that the gears be protected from air. Gears are stacked one on the other in piles about 3 ft. high and are carried on a moving conveyor through the furnace immediately over the resistance units.

When gears were taken out of the furnace without any protection, the top gear and the teeth of some of the others did not retain uniform hardness. A can made from ordinary sheet steel was first used to slip over the pile of gears during the heat-treatment and cooling. Since the gears were subjected to a temperature of 1,800 deg. F., considerable scaling took place and the scale would fall on the resistance units and cause short circuits. Obviously this material would not do, so, after some study, it was decided to use a patented high-chromium alloy for the cans. After further experimentation sheet Nichrome was the material selected, but there was a question about practicability of welding it and the plant operator was asked to use his ingenuity.

Strips cut from the sheet were used as welding rods. The seams were welded without flux, using a flame containing a slight excess of acetylene. The first lot of cans was made by setting the dished head into the shell and welding the upstanding edges. One slight difficulty developed; the inset dished heads sagged sharply and finally broke away. The heads were reversed to give them longer life and this new design proved entirely satisfactory. — *Oxy-Acetylene Tips*, July.

New Gasoline for Airplanes

A new airplane motor fuel of unblended natural gasoline was successfully tried out in 13 of the planes of the National Air Tour. The new product, which has the trade name of "Naturaline," weighs about half a pound less per gallon than ordinary gasoline. It is a stabilized gasoline recovered from natural gas. It increased the revolutions per minute of the motor, and saved as much as 3.25 gallons per hour of flight. —J. C. Chatfield, *National Petroleum News*, July 20.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Adequate Airports Vital

IT IS becoming more and more evident that the critical weakness in practical aviation is the lack of adequate airports. Little has been published concerning the difficulties encountered by the various transatlantic fliers because of the absence of decent facilities in the vicinity of New York City, but the difficulties were real enough. Miss Rasche, the German aviatrix, ran into them immediately when she wanted to get her plane assembled and housed.

New York is not alone in this predicament as was shown by Col. Lindbergh's inability to make a landing at the new Portland airport because of fog. Radio direction signals would probably have made it possible for him to meet his appointment at that city. The Byrd crew's experience with fog and no direction signals is a classic. Engines and planes and pilots are adequate but airports, with few exceptions, are not.

A Small Town Problem

HOW can the manager of the only important industry in a small town keep his employees actively interested in the progress of the business? This is the problem facing such a manager in a plant that has many years of honorable service behind it. The manager is young, energetic, a college-trained engineer, and he has risen to his present position by sheer merit, coming up through the shop in a way that has given him the valuable asset of knowing all of his several hundred men by their first names. One could hardly picture a better setting for satisfactory industrial relations. As a matter of fact, there never has been a strike in this plant.

On the other hand the fact that most of the men own their homes and are quite easy in their minds regarding the security of their jobs has given them the feeling that they did not have to struggle very hard to hold them. The obvious sequel to this attitude was a village tradition that nobody who worked for the company had a chance to get promoted and consequently very few did anything to earn promotion. The manager did everything he could think of to shake the men out of their complacency, but without avail. He tried shifting them to different jobs but they only became unhappy and begged to be put back. Naturally, then, he was forced to make the tradition a reality by bringing in new blood when positions requiring initiative had to be filled.

This problem is not peculiar to the shop mentioned, it is one that exists in most shops of the kind, but perhaps not to the same extent. There is probably no solution that will fit more than a few cases, but one worth trying would be to put the most likely men in positions of responsibility and let them sink or swim. It is almost certain that a few would rise to responsibility, finding resources within themselves quite unsuspected. The rest would drop back and the company might lose some money in the process, but it would be money well spent if only one good executive were developed.

The Receiver of the Buck

PASSING the buck is a custom so generally practiced throughout almost every phase of human activity, not excepting industry, that the old slang expression is hardly slang today. The passing is very pleasant for the passers, as it usually relieves them of unpleasant responsibilities, although this very relief is anything but strengthening to their moral fiber. But what of the receiver? For there must be some individual at the end of the line who must assume the responsibility because there is no one to whom he can pass it.

In the average manufacturing shop this individual is quite likely to be the foreman. In the last analysis it is up to him to get out the work, and just how he is to do it, under the adverse conditions that sometimes exist, is given less attention by the higher-ups than it deserves. All along the line from the signing of the sales order to the shipping of the finished product there are opportunities for delay and procrastination. But when a delivery date is promised and the sales department, the engineering department, the planning department, have each taken a day or so more than the time allotted to it, the foreman of production has to take up the slack and try to get out the work in half the time he should have for the job. Sometimes he fails, but more often he accomplishes the impossible and saves the face of the company in spite of the derelictions of other departments.

All honor to the foreman who can do such things, but little credit to the management that permits the other departments to make it necessary.

Shop Equipment News

Melling Crankshaft Cheek-Facing and Pin-Turning Lathe

THE Crankshaft Machine Co., Jackson, Mich., has marketed the Melling cheek-facing and pin-turning lathe, illustrated, which is so designed that it faces simultaneously the cheeks adjacent to the crankpins and rough turns the crankpins of a crankshaft in one operation. The machine is of the semi-automatic type in that the operator merely loads the crankshaft, throws in the clutch and feed lever, and removes the finished work after the machine has completed its cycle and stopped automatically. The automatic cycle includes the lowering of the cradle and the tool holder to the cutting position, the feeding of the work table to the proper depth and then back to the original position, and the raising of the cradle and the tool-holder to permit the removal of the finished work. The machine is furnished for crankshafts of the four-, six- or eight-cylinder type.

The machine is constructed ruggedly throughout, having a heavy cast-iron bed upon which the sub-units are mounted. The sub-units consist of a rear master shaft, Fig. 2, equipped with eccentrics that are made and mounted in relation to the crankshaft to be turned; a cradle assembly, likewise consisting of the same number of throws of the crankshaft; a front master shaft; and the work spindle, which is mounted to the machine table. The cradle is pivoted on the rear master shaft so that it can be operated vertically to facilitate the loading and the unloading of the work. A stop is provided on the machine bed to limit its downward movement.

The tool arms, to which the cutting tools are attached, are carried on the front and the rear master shaft and, consequently, travel in unison with relation to the crankshaft being turned. Each tool arm has a hardened tool holder attached to it into which three cutting tools are held. The tools are arranged so that the middle tool cuts the center portion of the pin bearing, and the outer tools cut the faces of the cheeks and the end portions of the pin bearing. This feature permits the end tools to be adjusted irrespective of the middle tool.

Tool arm rolls, attached to the front end of the tool arms, are located above the cutting tools, slightly ahead of the centerline of the work, bearing on the crankpin of the shaft being turned, thus holding the tool in the correct cutting position and preventing them from "digging in" to the work.

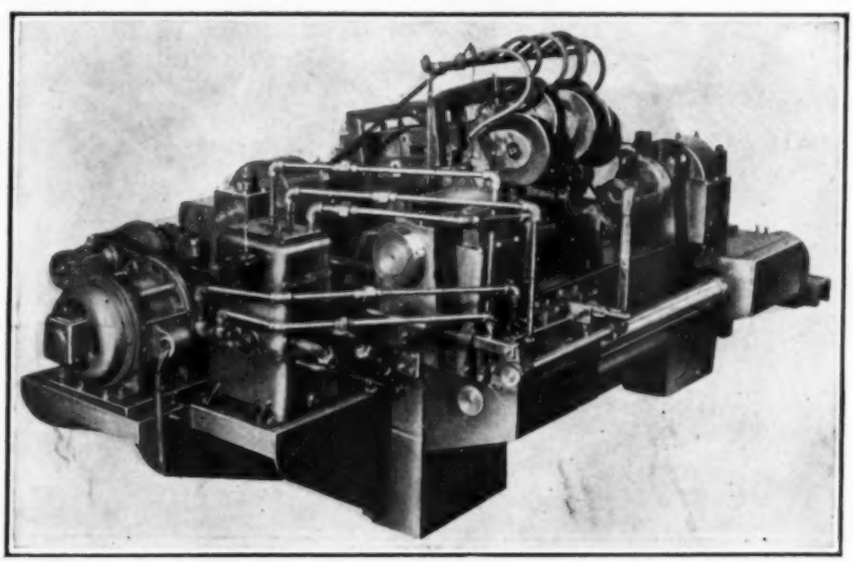

Fig. 1—Melling Crankshaft Cheek-Facing and Pin-Turning Lathe

The machine is driven by 20-hp. motor, located on the left-hand side of the bed. The motor, through a silent chain, drives the main drive shaft located at the rear, which in turn engages two cross shafts, one on each side of the machine. From these cross shafts are operated the rear master shaft and the work spindle.

The two cross shafts are driven from the main drive shaft by beveled gearing, the left-hand drive having an adjustment feature provided so that proper timing of both shafts can be made. A friction clutch mounted on the main drive shaft, next to the driving gear, is operated by a lever positioned at the front side of the machine. The compound pump is driven by a belt from the drive shaft.

The driving motor also operates the Oilgear feed pump located on the same side of the machine. The operating cylinders are positioned on the right-hand side of the machine. They operate the feed of the work table and the vertical movement of the cradle. The table feed is arranged so that the table has three automatic operating motions; an inward travel for the facing of the crank cheeks, a slower feed for the facing of the pin bearings, and a rapid traverse. The feed can be stopped at any desired position.

The work table, mounted on two ways, is operated from both ends by racks mounted on the underside of the table casting. The racks are driven by spur gears attached to the table cross-feed shaft. The shaft is mounted with end and radial ball bearings. The shaft receives its motion from a rack and gear, located on the right-hand side of the machine, which are operated by an Oilgear cylinder and plunger. The table cross-feed shaft is heavy in construction to assure accuracy.

The crankshaft to be turned is located and fastened in two chucks, each chuck being provided with a strap for clamping the crankshaft in place, and a driver and locking screw to hold the crankshaft firmly in position. A steadyrest supports the crankshaft by its center bearing.

Shop Equipment News

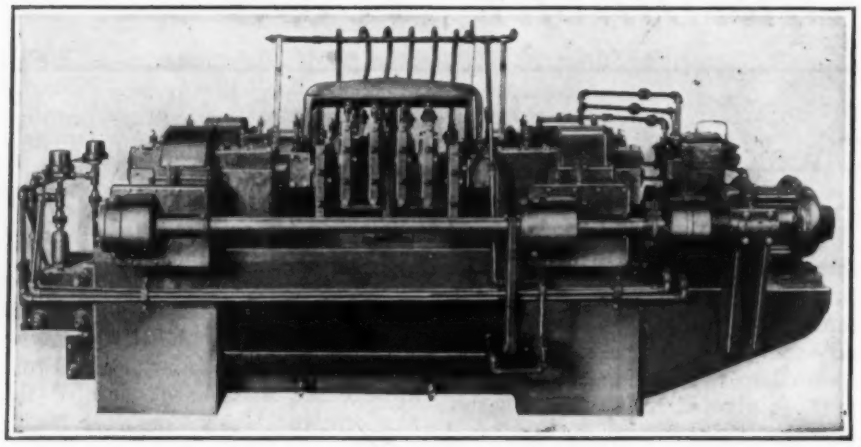

Fig. 2—Rear view of the machine

or by an intermediate bearing. A positive drive is obtained from both chucks.

A large reservoir for the cutting compound is cast integral with the bed. The compound is pumped through a cross member, located over the front master shaft, to which flexible hose are attached. The opposite ends of the hose are connected to the tool arms so that the compound is fed directly to the tools.

The approximate floor space of the machine is 11x6 feet.

Barnes Horizontal Duplex Boring Machine

THE horizontal duplex boring machine shown in the accompanying illustrations was recently built by the W. F. & John Barnes Co., Rockford, Ill., for simultaneous drilling, boring, hollow milling, box milling, line reaming, chamfering and facing to accurate depths. Both the fixture and the machine were designed to eliminate vibration and consequent tool chatter.

The left head contains ten spindles in five groups of two each, and the right head four spindles in two groups of two each. The spindles are mounted in Timken tapered roller bearings and are driven by hardened steel gears, both the spindle bearings and the gears being oiled by splash lubrication. On account of the large area over which the spindles in the left-hand head are distributed, a cascade oiling system is also employed, and the pump used is located at the rear of the head and driven from one of the spindles. A supply tank for this pump is mounted on the back of the head. Each spindle has nose adjustment to provide for accurate tool setting and to compensate for grinding of the tools.

Each drill-head carrying unit is separately cast and is scraped, dowelled and bolted to the saddle, so that the head can be replaced at any time without affecting the basic construction of the machine. The head units are driven by individual motors mounted on the rear of each head. Standard commercial squirrel-cage motors are used and can be readily removed or replaced by other standard motors if necessary.

The saddles are scraped on top to receive the heads, and on the bottom provide a bearing on the ways of the bed. The saddle crossheads to which the feed mechanism is connected are bolted and dowelled to the under side of the saddle. The bed is cast of semi-steel in one piece with heavy cross ribs to insure rigidity and alignment. In the center of the bed is a large chip pan, and along each side for almost the entire length are coolant troughs, also cast integral with the bed. The bed is closed at the bottom, forming the coolant sump.

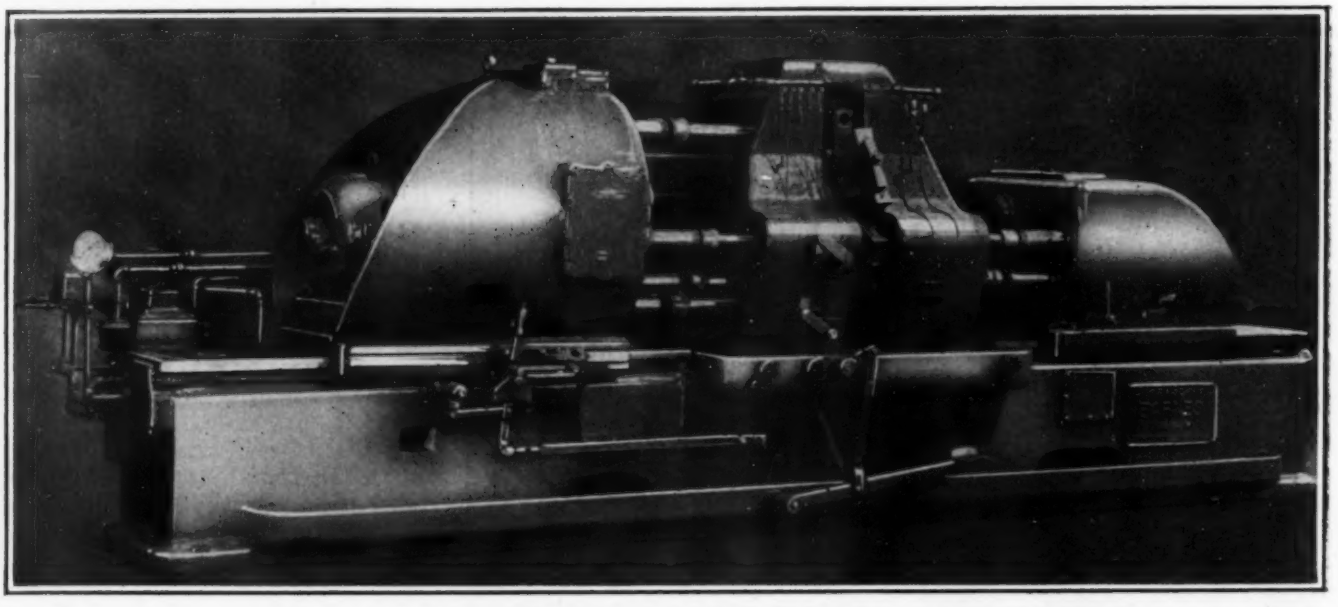

Fig. 1—Front view of the Barnes Horizontal Duplex Boring Machine

Shop Equipment News

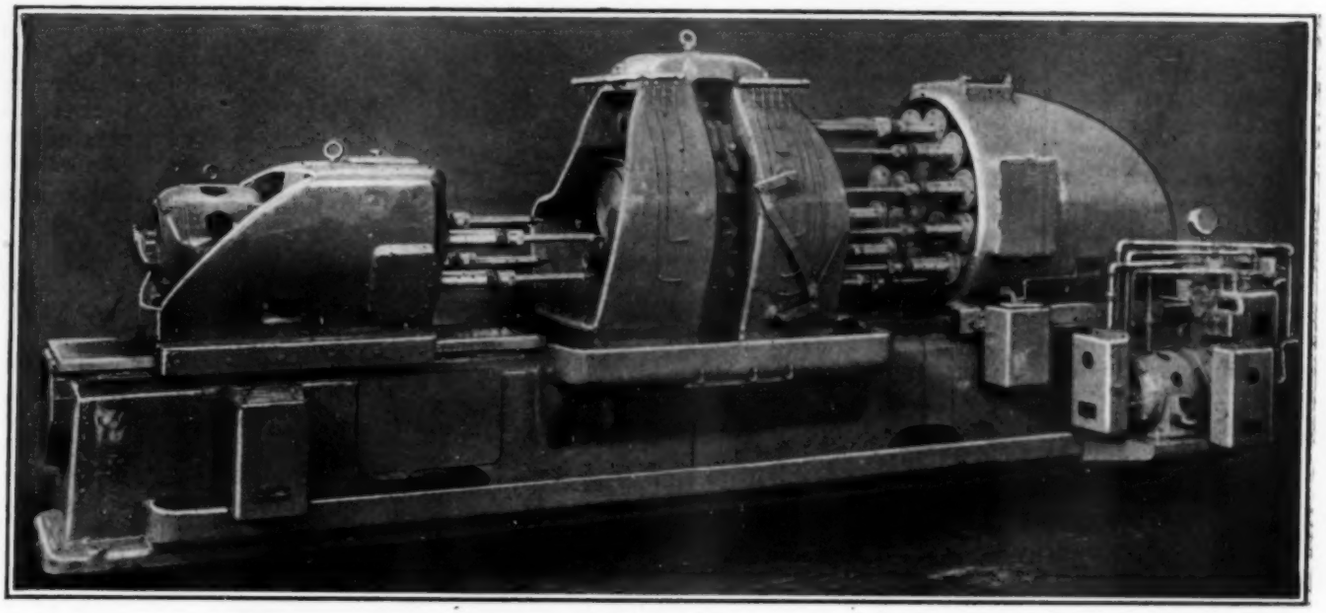

Fig. 2—Rear view of the machine

The boring heads are fed hydraulically by means of an Oilgear type QM full-automatic pump. One cylinder feeds both heads through rack and pinion, and this unit is inclosed in the bed. The pinion is carried in a heavy, specially-constructed support and is mounted upon Timken roller bearings. Through adjustment of the Oilgear mechanism, practically any desired rate of feed may be obtained. The cycle of this particular machine is rapid traverse forward, automatic trip to slow feed for drilling, boring and hollow milling, automatic trip to slower feed for facing, followed by automatic quick return. This cycle is fully automatic after the operator trips the feed by a hand lever, thus starting the head forward.

The six-station trunnion fixture provides for loading two castings in each station. While the operator unloads and loads one station at the front, all other five stations are operative. The bushings for the several tools are very long and of as large diameter as the tool will permit. Liner bushings of hardened steel are pressed into bosses in the casting, which act as bushing plates and trunnion supports. Slip bushings fitting to these liners are used to guide the tools.

The overarm of the fixture ties the trunnion supports together and furnishes an oil reservoir from which leads, controlled by sight feed oilers, supply lubrication to each bushing and to the trunnion bearings. Two lock pins, operated simultaneously by a foot lever at the front of the machine, control the rotation of the trunnions, and are said to assure both accurate alignment and positive locking. The trunnion is 9 in. in diam., and dust rings and washers are used to prevent dust from entering.

The total weight of the machine, including the motors, is approximately 18,000 pounds.

Kelly 26- and 32- Inch N.T. Crank Shapers

THE R. A. Kelly Co., Xenia, Ohio, recently placed on the market the types NT and NTR 26- and 32-in. shapers, one of which is shown in the accompanying illustration. All machines are equipped with plates at the back of the column for bolting a motor for motor drive. Single-pulley drive can also be obtained.

The ram is of the V-type with full-length gib adjustment and is heavily ribbed and braced to withstand distortion. A projection or guard on both sides of the ram prevent dirt from entering the bearing. The crank block is of gray iron, bushed with bronze. It is said to be of extra long length. The crankpin is of steel and has V-type guides adjustable by taper gibs. It is set deep in the face of the main gear, thus bringing the rocker arm close to the face of the gear. It is bronze bushed where the stroke adjusting screw fits in the crankpin. The main gear is of semi-steel construction with generated helical teeth and its bearing is of large diameter and length. The web of the gear is reinforced with cross ribs to prevent distortion under heavy cuts.

The rocker arm is of semi-steel and is suspended at the bottom. It is also heavily ribbed on the side. The link pins are hardened and ground.

The particular feature of the column is the V-type method of holding the cross-rail to its front, wherein the pull of the tool is taken by the solid metal Vs. The crank gear bearing is a separate casting fitting in an accurately bored hole, thus providing a replaceable bushing where needed. The heavily ribbed dished side wall of the column has been retained. The construction necessary to hold the V-type ram is said to add strength and rigidity to the top of the column. The bottom of the column is closed to act as an oil reservoir.

Bolted direct to the side of the column is a gear box containing alloy steel gears, hardened and mounted on multiple-splined shafts. The bearings are of either ball or roller type throughout. An index plate on the top of the box indicates the speed of the ram for the various gear positions. Drive is through a friction clutch incorporating a disk-type brake for

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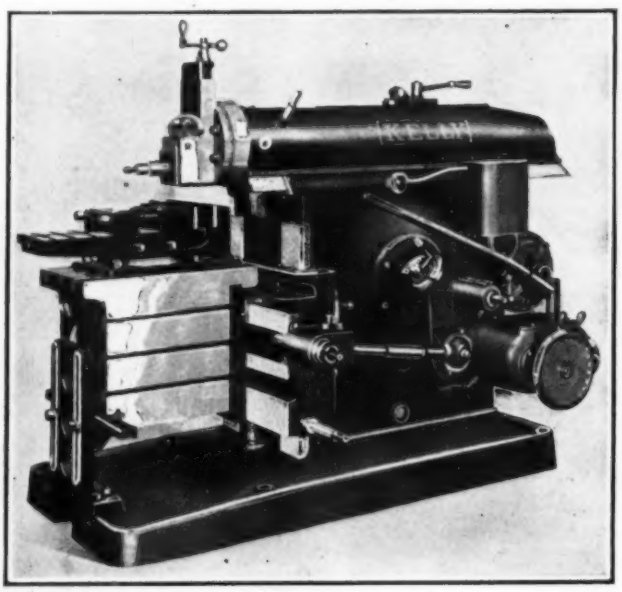
quick stopping. The motor used is of constant-speed type, and all speed changes are obtained through the gear box and back gears. The back gearing is also made of hardened steel.

The tool head has full-length taper gib adjustment at the top and is clamped to the ram by four bolts set out near its greatest diameter. The toolpost is drop forged, and is said to be of unusual size.

The table is of box construction with a small opening in the front and back. It hooks over the apron and is bolted down to the same, so that the thrust of the cut is not taken by the holding bolts but by the rib on top of the apron. The table has T-slots on both sides and the top, all horizontal. A table support is provided at the front of the machine. The cross feed mechanism of the table is of simplified construction, and no moving parts are exposed. The feed is actuated by a single-disk cam, giving a smooth even motion. This cam is designed so that the feed takes place only on the return of the ram. A direct-reading dial on the hub gives the amount of feed. A safety device prevents over-travel.

The oiling system is entirely automatic. The reservoir in the base of the column contains 6 gal. of oil, and a pressure pump forces the oil to an oil filter located at the top of the column through sight feed glasses. From the filter, the oil is distributed to a header inside of the column, from which it is led to the bearings by suitable ducts. In addition, a constant stream of lubricant is directed on the gears inside of the column and the rocker arm block. The same system also supplies oil to the gear box on the outside of the column. As a result, the oil is strained once and filtered twice.

A 5- to 7½-hp. motor is required for the 26-in. shaper and a 7½- to 10-hp. motor for the 32-in. size. The respective weights of the single-pulley models are 7,500 and 8,000 lb. net.

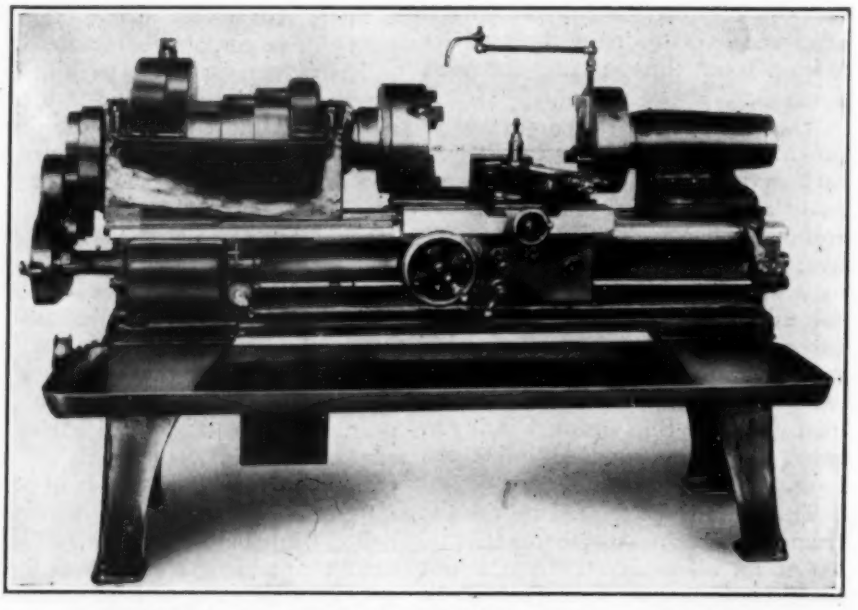


Kelly 32-Inch N. T. Crank Shaper

Springfield 16-in. Lathe Modified for Broach Cutting

The Springfield Machine Tool Co., Springfield, Ohio, has modified the design of its 16-in. engine lathe for the manufacture of broaches. The machine has a hole 3⅝ in. in diam. through the spindle and also through the tailstock. A connected compound and plain rest is furnished in order that forming tools can be used in connection with a finishing tool in the front mounted on a compound rest.

The machine was built up on the regular 16-in. standard engine lathe design. The spindle is of necessity much larger and the back gear ratios were increased to take care of the particular work in hand. An oil pan and coolant pump has also been provided.



Springfield 16-Inch Lathe Modified for Broach Cutting

General Electric A.C. and D.C. Solenoids

The General Electric Co., Schenectady, N. Y., has designed a line of solenoids of both a.c. and d.c. types for use on all voltages and frequencies up to and including 550 volts, the various types varying from each other in size only. In Fig. 1 the series, designated as CR-9503, is shown, while in Fig. 2 the construction is indicated.

Each size of solenoids has four types made up of the same frame. Thus, any solenoid can be adapted to a wide variety of applications. A pulling solenoid may be changed to a pushing one by adding two standard pusher bars. The pole face of the plunger is cylindrical and fits into a cylindrical seat on the frame, so that quiet operation is always insured.

All coils are wound on molded compound spools to eliminate the possibility of grounds. Bakelite guides prevent the plunger from wearing the spool body. Springs hold the coil in position and prevent vibration.

In the d.c. type of solenoid one sec-

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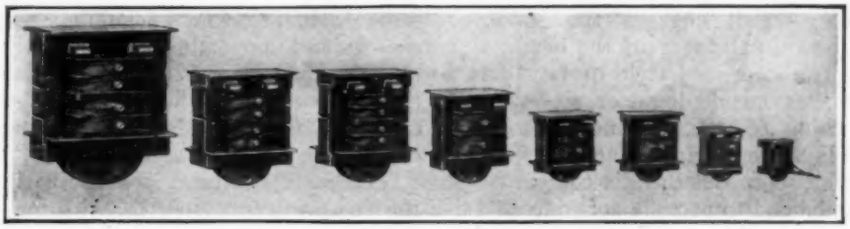


Fig. 1—General Electric A.C. and D.C. Solenoids

tion of the coil is a high-resistance section which is short-circuited by the cutout switch until the stroke is nearly completed.

In addition to the usual switch and relay operating service, these solenoids can be used for tripping mechanisms, such as brakes, toggles and the like, clutch-operating mechanisms and safety appliances.

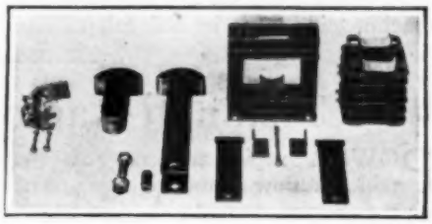
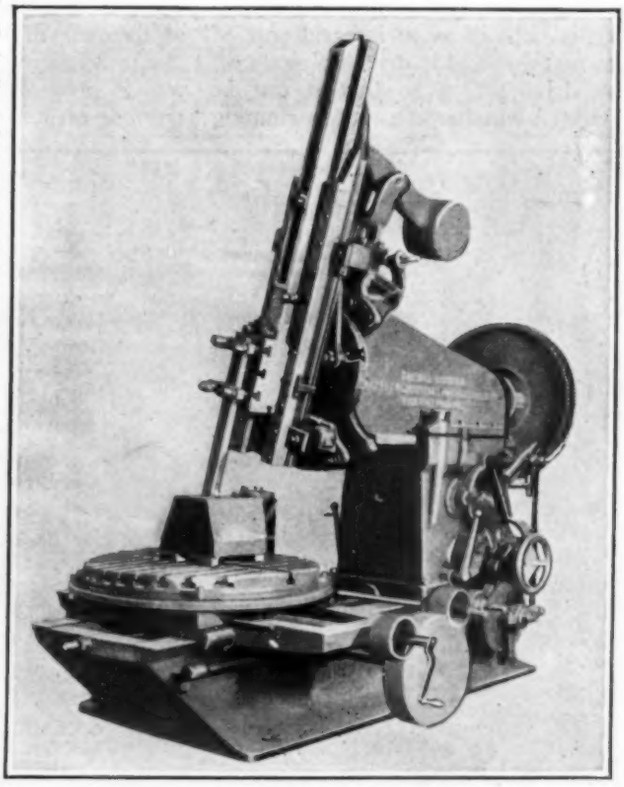


Fig. 2—Construction of the Solenoids

Dill Improved Traveling-Head Slotter with Angle-Cutting Attachment

THE Nazel Engineering & Machine Works, Philadelphia, Pa., has improved the Dill traveling-head slotter, of which they are the manufacturers, by providing an angle cutting head. With this feature the cutter head can be adjusted 15 deg. on each side of the center, thus making the slotter universal. The angle-cutting head with the ram and ram guide forms a separate unit and is fitted on a hub (turned concentric with the crank shaft) on the front of the traveling head and is securely clamped at the top and bottom. Adjustments of the angle-cutting head are obtained through a worm, which is secured by brackets to the traveling head, and a worm rack bolted to the angle adjusting head. The head is indexed in degrees, and for accurate adjustment a dial graduated in minutes is placed on the worm angle-adjusting shaft.

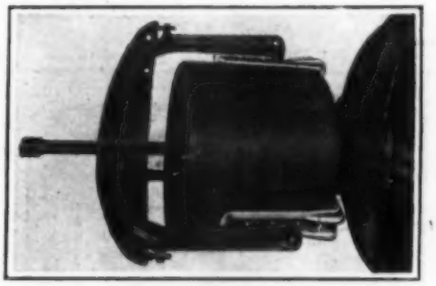
The ram guide for this device is fitted with taper gibs at top and bottom to prevent springing when the cutting thrust is against the gib side. This angle-cutting head in connection with the traveling head of the Dill slotter makes this machine especially adaptable for the machining of angular surfaces at a single setting of the work.



Dill Traveling-Head Slotter with Angle Cutting Attachment

Crane Wheel Puller with Extension Jaws

The Crane Puller Co., Waltham, Mass., is supplying extension jaws in two sizes for use with its wheel puller. This device is especially designed for removing wide-faced paper pulleys. The illustration



Crane Wheel Puller with Extension Jaws

shows the puller removing such a pulley from a motor shaft.

The No. 3 size extension jaw takes pulleys 18 in. in diameter by 22 in. face, while the No. 3X size takes pulleys 24 in. in diameter by 26-in. face.

Cutler-Hammer "AAA" Across-the-Line Starter for Small Motors

This "A A A" across-the-line starter, designated as C-H 9586, was designed by the Cutler-Hammer Manufacturing Co., 323 N. Michigan Ave., Chicago, Ill., to control motors of 5-hp. and under. Push-button control is used for starting and stopping. The unit incorporates thermal overload protection and no-voltage protection. The outward appearance is indicated in Fig. 1, while Fig. 2 shows the interior construction.

The unit is small in size so that it can be mounted where the control station would ordinarily be placed, as it does not take up much more room than a push-button station. The starter can be furnished to machinery builders without the case for incorporation in the machine.

A special type of contactor is featured in this starter. A roller is

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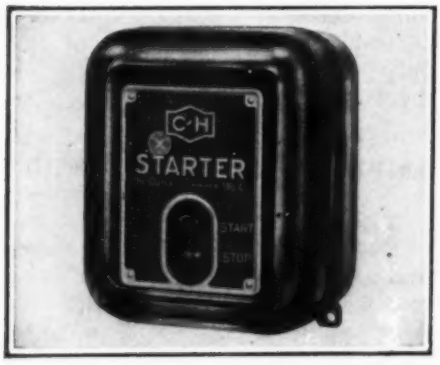


Fig. 1—Cutler-Hammer "AAA" Across-the-Line Starter for Small Motors

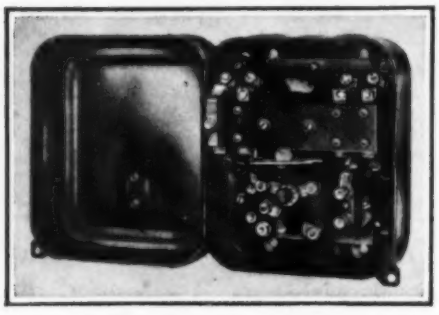


Fig. 2—Interior construction of the unit

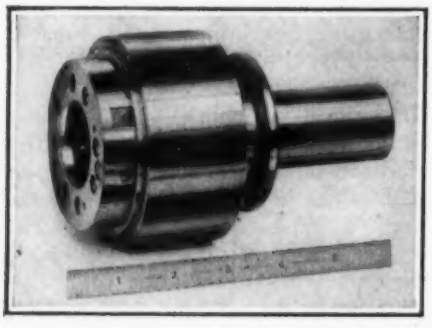
forced between two fingers to complete the circuit. Thus a double break and a wiping contact are secured. This arrangement is said to reduce arcing to a negligible amount. To adapt the starter for any horsepower within its rating it is only necessary to insert the proper size heater coils in the thermal overload relay.

H&G Style EE Diehead

The Style EE H&G diehead is announced by the Eastern Machine Screw Corporation, New Haven, Conn. It is designed for use on rotating die spindles. The head is both opened and closed by means of one yoke which engages the spool or groove in the rear of the head.

The improved style of head has a smaller outside diameter, an improved locking and tripping mechanism, and is lighter in weight than the previous models put out by this company. It is claimed to provide accurate adjustment for length of thread cut and, because of its single-yoke construction, installation on automatic screw machines is said to be simplified. The same basic principle of holding the chasers and supporting them directly over the chamfer has been retained as has the positive opening action as in other H&G dieheads. The same chasers may also be used.

The Style EE head is available in the following sizes: $\frac{7}{16}$ in. with outside diameter of $2\frac{3}{8}$ in., $\frac{9}{16}$ in. with outside diameter of $2\frac{7}{8}$ in., 1 in. with outside diameter of $3\frac{1}{8}$ in. and $1\frac{1}{4}$ in. with outside diameter of $4\frac{5}{8}$ in.



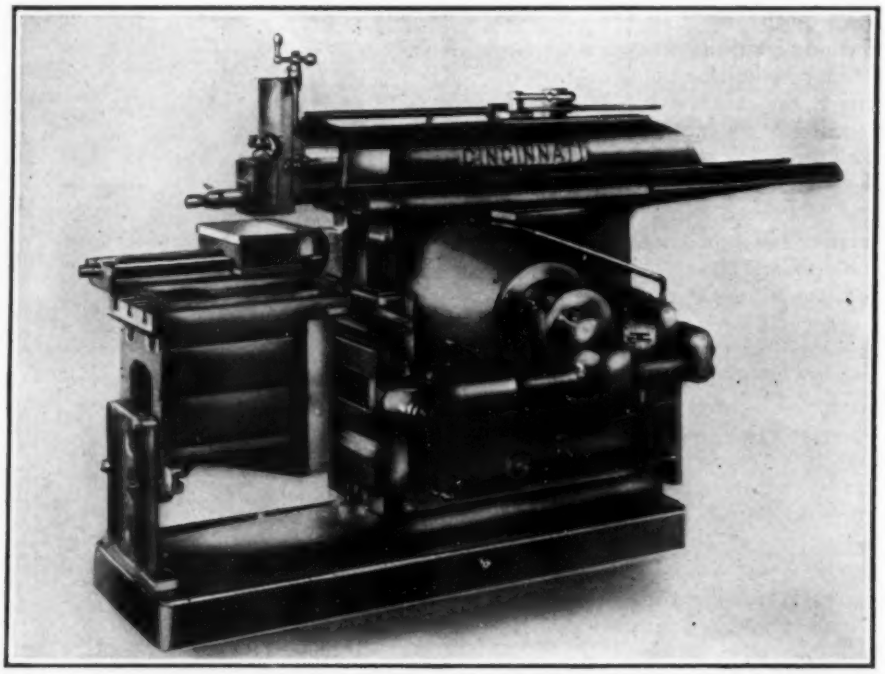
H&G Style EE Diehead

Cincinnati Rapid Traverse Shaper

POWER rapid traverse of the table is now standard equipment on the shapers made by the Cincinnati Shaper Co., Cincinnati, Ohio. This construction is applied to all sizes of shapers from 16- to 36-in. stroke, both of the universal and regular type. This improvement has been made in order to increase the speed of operation and to reduce the effort on the part of the operator. The curved lever shown at the center of the machine in the photograph is used to control the movement, the direction of which is determined by the small feed engagement lever just as the feed itself is controlled.

The power rapid traverse mechanism is built in as an integral part of the machine and is driven directly off the drive pulley so that it can be operated whether the ram is running or not. It is driven through the regular feed friction shaft which acts as a safeguard against damage if the work is run to the extreme end of the rail or against the tool. The same automatic oiling system used to lubricate other parts of the machine is used to lubricate the traverse mechanism.

An improved ratchet crank has also been added to the machine. It is idle during quick traverse but can be readily used for hand feeding. The length of the ram bearing has been increased and at the same time the overhang of the tool in front of the ram bearing has been reduced by about 2 in. A guard has been added at the rear of the shaper to protect the ram bearings from dust and grit and to prevent the ram from hitting any one on its return stroke. A sin-



Cincinnati Rapid Traverse Shaper

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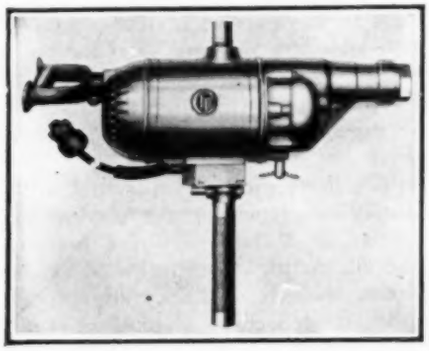
gle screw vise is now furnished with a flat top accurately ground for use with an indicator or gage. Also a clamp screw for the tool slide has been added.

All other features such as automatic oiling, cam feeds, internal transmission, and direct reading controls are retained as in previous models.

Cincinnati Type UR 2-Speed, ⅞-Inch Electric Drill

The Cincinnati Electrical Tool Co., Cincinnati, Ohio, has recently added to its line a 2-speed portable electric drill of ⅞-in. capacity, known as Type UR. At its rated capacity, the tool operates at a normal speed of 380 r.p.m., but since this speed is too slow for the efficient use of smaller size drills, a higher speed is also provided. Shift from low to high speed may be made with the motor running.

The Type UR drill is fitted with a No. 2 Morse taper socket in a removable sleeve. It is held in the drill spindle by a large hexagonal



Cincinnati Type UR 2-Speed, ⅞-Inch Electric Drill

nut. The tang of the drill bit protrudes slightly beyond the end of the sleeve, so that a drift is not necessary to remove the drill. Other features include the use of vanadium alloy steel gears and deep-groove radial ball bearings. A ball thrust bearing is also provided to take up end thrust. Lubrication is provided through grease reservoirs, and heavy felt washers protected by metal retaining rings prevent leakage.

Square-type brush holders are used, fitted with so-called "pig tails" or shunts. The patented "Cincinnati" fully-inclosed switch with cable clamp is also standard on this tool.

Gorton No. 3-X Universal Die-Sinking and Engraving Machine

THE No. 3-X universal die-sinking and engraving machine, made by the George Gorton Machine Co., Racine, Wis., is suited to either heavy or light engraving and die sinking on flat or spherical surfaces. It is claimed to be a precision tool, developed for general-purpose work. It is specially adapted to heavy cutting on steel dies, stamps and similar jobs in brass and cast iron which can be performer on the No. 1-S machine. It is also said the machine can do light and sensitive work, such as delicate lettering, similar to the work performed on the No. 1-A and 1-G machines, which it resembles in type, but is of much heavier construction.

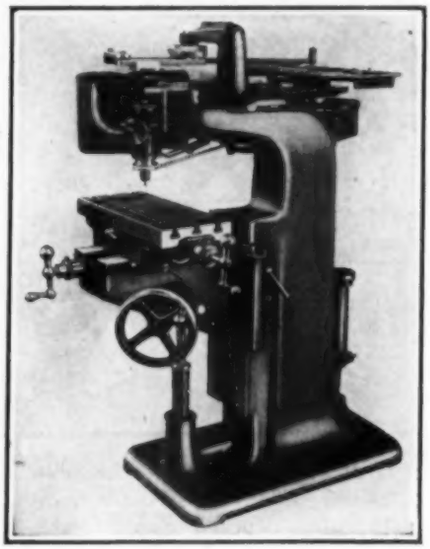
Pantograph bars graduated with reductions 3, 4, 6, 7, 8, 10, 12, 14, 16 are standard, but reductions 3 to 1 down to 0 to 0 are also obtainable. All the pantograph joints are equipped with special ball bearings. The two slider blocks on the pantograph bars are tongue and grooved with clamping gibs, and are all accurately fitted. The machine is also equipped with a heavy forming bar and guide for engraving on concave, convex and spherical surfaces contained within an area of 2⅛ x 4¼ in. The maximum forming-guide rise and fall is ⅝ inch.

The cutter head and link is of heavy and rigid construction and is also mounted on ball bearings so that it can be moved about by means of the tracing arm without much effort. The spindle is also mounted on ball bearings and has speeds of 2,300 to 9,000 r.p.m. The spindle has special collet bushings for ⅛, $\frac{3}{16}$, ¼ and $\frac{5}{16}$ in. straight-shank cutters. The spindle has a vertical feed of $\frac{7}{16}$ in. It is hardened and carefully finished inside and out by grinding.

The table is 8 in. wide by 19 in. long, and has three T-slots. Both the table and saddle feed screws have micrometer collars, graduated in thousandths of an inch. Taper gibs are used to eliminate play between the sliding surfaces. The table or longitudinal feed is 12 in., and the saddle or cross feed 8¾ in. The end of the spindle varies from 1¼ to 13¾ in. above the top of the table. The machine will regularly handle a disk 5 in. thick and 36 in. in diam. or smaller, or a drum 13 in. high and 26 in. in diam. or smaller.

The knee is a box casting which is raised and lowered by a handwheel at the front provided with a graduated collar reading in thousandths of an inch. The knee is carried by a telescoping screw against a ball bearing.

Drive is by endless linen belts from a motor mounted on the left side of machine. Vertical adjustment of the



Gorton No. 3-X Universal Die-Sinking & Engraving Machine

motor is readily obtained by means of the handwheel on top of motor post. A swinging arm, mounted on the column, carries the idler and driving pulleys, and is connected to the cutter head with an adjustable belt tension rod. With this construction the arm is allowed to swing through an arc in unison with the cutter head, while the belt is kept under uniform tension regardless of the position of the head. Both the arm and the pulleys are mounted on ball bearings contained in dust proof housings. A complete set of accessories can be obtained. The motor is rated at ½ hp. at 1,700 r.p.m. and carries a 2-step cone pulley.

The machine occupies a floor space of 54 x 44 in. and measures 54 in. high. Its approximate weight is 1,020 lb. net.

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Grand Rapids No. 1½ Universal Cutter and Tool Grinder

THE Grand Rapids No. 1½ universal grinder has been designed by the Gallmeyer & Livingston Co., Grand Rapids, Mich., to meet the demands for a high-grade machine of medium capacity with convenience of operation. These machines can be operated from the front or rear. Transverse, vertical and longitudinal movement can be made from either

Grand Rapids No. 1½ Universal Cutter and Tool Grinder with Motor Drive

position. Longitudinal movement may be operated by either handwheel or lever. The machine is designed so that the knee, saddle, subtable and table can be swung entirely around the column while the table swivels on the subtable through 180 degrees.

Both vertical and cross movements are provided by means of an Acme thread operating in a bronze nut. Graduated dials reading in thousandths of an inch are used to indicate the amount of movement. The saddle and knee bearings are of large size and are gibbed to take up the wear. Screws, nuts, and bearings are said to be carefully protected from grit and dirt.

The longitudinal movement is provided by means of an accurately cut steel rack meshing with a cut steel pinion mounted on a ground shank. This construction is said to insure a free movement practically devoid of back lash thus assuring accurate work and convenience in taking short, quick strokes. The machine is said to be rigidly constructed throughout as are the attachments.

The machine is equipped with a hammered crucible-steel spindle accurately ground and running in phospher-bronze bearings with convenient means for adjustment to compensate for both radial wear and end play. The headstock is of the universal type with swivel base graduated in degrees so that any angular setting can be arranged. The headstock is bored to take B & S No. 12 taper and bushings are provided for other taper sizes.

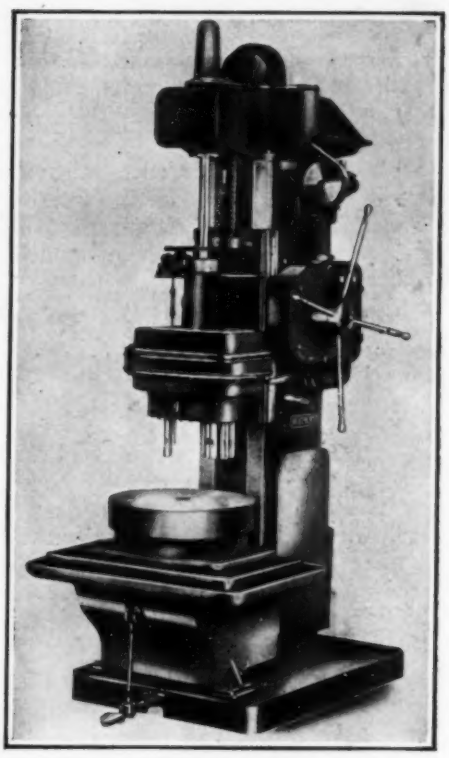
The machine can be furnished either for belt drive or for self-contained motor drive. In the latter case the grinding wheel spindle is driven by a 1-hp. motor built into the base of the machine and belted to the spindle through the column. The standard spindle speed is 3,450 r.p.m. The headstock is driven by a ¼-hp. motor built into it. The motor headstock is only required for internal and cylindrical grinding work and is not necessary when the machine is to be used for cutter and reamer grinding only.

SPECIFICATIONS

Size of table, in	5x26
Longitudinal travel, in	16
Traverse movement, in	8
Vertical movement, in	6½
Maximum swing, in	9½x20
Capacity for face milling cutters, in	12
Net weight for standard equipment, lb.	786

Footburt No. 15½-F Multiple-Spindle Drilling Machine

In order to provide a multiple-purpose drilling machine, the Foote-Burt Co., Cleveland, Ohio, has designed the Footburt No. 15½-F machine shown in the illustration. It is equipped with a flanged sliding unit to which multiple heads may be bolted. To change from one job to another it is only necessary to change the head. Two dowels in hardened steel bushings are used to locate the heads accurately in the slide, to make



Footburt No. 15½-F Multiple-Spindle Drilling Machine

the changeover positive and simple.

With the exception of the flanged type slide, the machine is of the same design as the regular Footburt No. 15½-F drilling machine and may be arranged for either motor or belt drive.

The drive mechanism is said to be simply constructed. An oil level is carried in the upper drive housing and all bearings are lubricated by the splash system. Lubrication of the heads is secured by a small oil pump mounted on the head. The machine illustrated is arranged with a head having two groups of spindles, but many other combinations are possible.

The circular table shown is the three-position indexing type. Three fixtures are mounted on this circular table. The front station is used for loading, the next one for drilling part of the holes, and the third for drilling the remainder. This arrangement was necessitated by the close centers. Other arrangements are possible such as using the front station for loading, the next station for drilling, and the third for reaming or counterboring. It is also possible to furnish a two-position table so that one or more pieces may be loading while the machine is in operation.

The index table is operated by a

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foot pedal which is located at the front of the machine. A downward pressure on the pedal withdraws the locating plunger from the pilot bushing in the table and at the same time the table is elevated $\frac{1}{16}$ in. on a ball bearing. With the outside bearing surface thus relieved, it is easy to index the table regardless of its size and weight.

Machines may be furnished with either a stationary box table as illustrated or with a vertically adjustable table for greater flexibility.

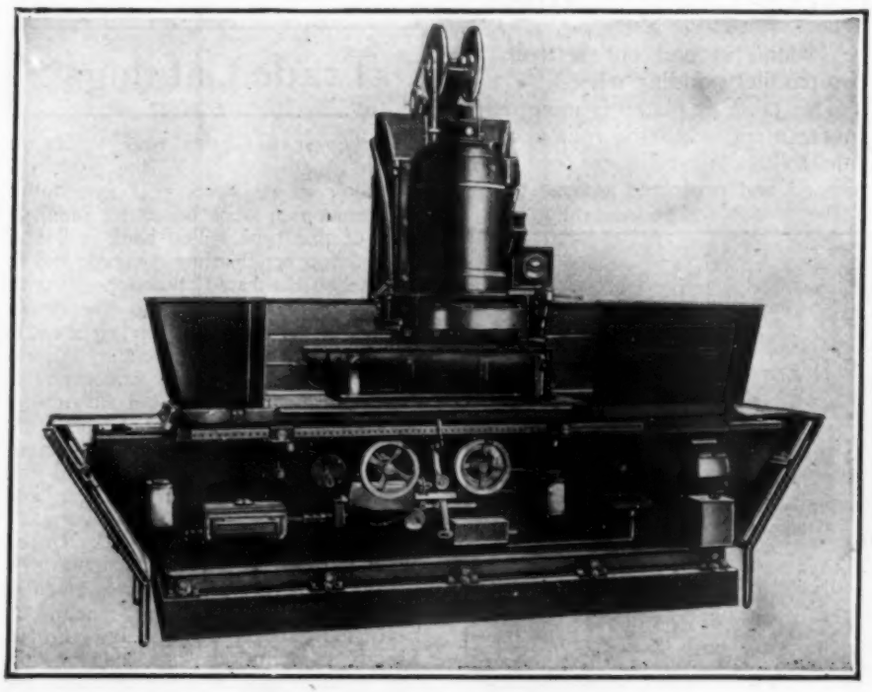
Precision Vertical Surface Grinder

THE precision-type vertical surface grinder illustrated is of foreign design and is being marketed in this country by L. Sichel, Room 740, 200 Fifth Avenue, New York, N. Y. It consists of a bed, table, upright column, and a direct motorized grinding head mounted on a slide. The unit is assembled on a common bedplate with means for accurate alignment of the bed in both vertical and horizontal planes. The machine is made in varying lengths and widths as well as grinding heights. The greatest width covered by the segment wheel is 25 inches.

The upright and bed are said to be well braced castings to minimize distortion. The bed is of such length with respect to the table that overhang is eliminated. The ways of the bed are accurately ground. The table can be reciprocated at various speeds and its stroke can be adjusted for length. Either hand or power feed by push-button control can be used.

The direct motorized grinding head is counterbalanced and can be elevated by hand or power and fed toward the work by power, the amount of the feed being adjustable. The motor armature is mounted integral with the spindle which is carried on ball and roller bearings of special design to eliminate end play. For truing segments a swinging device is provided, and the head may also be tilted from the horizontal position for grinding concave surfaces. It is said that the machine is accurate to 0.0003 in. over its entire working length.

Automatic lubrication is furnished as well as a water tank, pump and piping for wet grinding. The bed ways are protected by a cover which automatically unfolds and rolls up as the table advances and retreats. Beside the direct motor on the head two other motors are provided, one for the table feed and the other for the pump drive.



Precision Vertical Surface Grinder

Whitney No. 62 Angle-Iron Shear

The Whitney Metal Tool Co., Rockford, Ill., has recently put on the market the No. 62 angle-iron shear shown in the accompanying illustration. It is similar in appearance and has the same working principle as this company's No. 4 angle-iron shear, except that it is a heavier type. The capacity is for 3 x 3 x 1¼-in. angle iron or lighter.

Whitney No. 62 Angle-Iron Shear

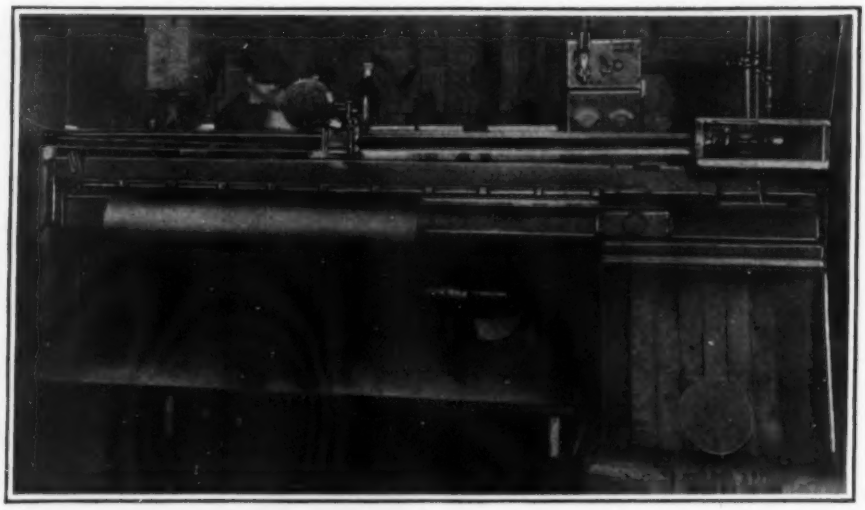
The shear has an eccentric gear, so that the leverage is equally distributed over the entire cutting blades. An adjusting screw is provided so that angles can be cut off square. A self-clamping pad is used to hold the angle iron in position, and a flat bar handle, milled to fit the socket, is furnished with each machine to operate the shear.

All wearing parts are hardened throughout. The inserted blade is made of tool steel.

Lincoln Automatic Carbon Arc-Welder for Range Boilers

The automatic carbon-arc welder for range boilers was recently brought out by the Lincoln Electric Co., Cleveland, Ohio, to meet the requirements of high production of this class of work. On 14-gage steel the welder makes a speed of 150 ft. per hr. and costs slightly over one cent per foot of longitudinal seam, it is claimed. The cost per foot on the

Shop Equipment News



Lincoln Automatic Carbon Arc-Welder for Range Boilers

head seams is somewhat less than on the side seams.

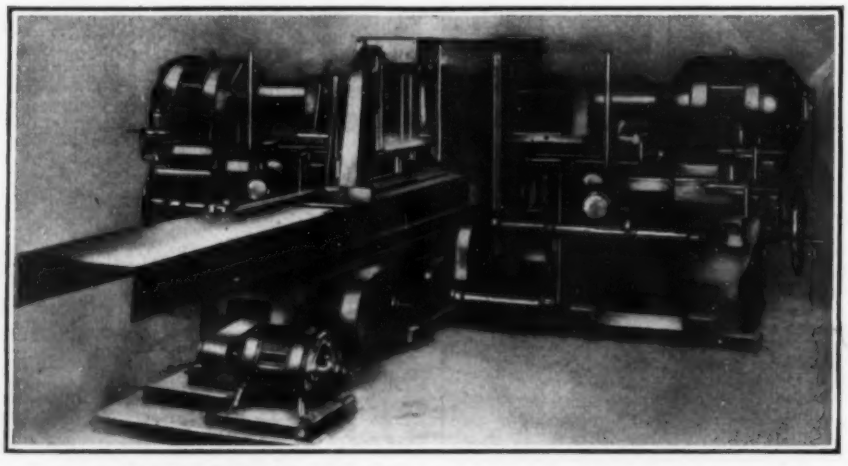
The side seam is welded with a filler rod which is laid on the seam and fused into the joint by the carbon arc. The range boiler is slipped on to the mandrel and the top clamps lowered to hold the seam in position. Water cooled copper guards confine the arc to the seam. The clamps also carry the upper rail on which is mounted the carriage for the automatic welding head. The operator merely starts the arc in operation and the motor-driven head is carried along the seam, fusing the filler and the edges of the seam together.

While this equipment was built primarily for the completely-welded range boiler, it can also be adapted to the welding of riveted and welded range boilers where the rivets are spaced rather widely and the weld is applied to the lap for tightness.

Badger No. 224 Double-Spindle Face Grinder with Extra-Long Table

THE Badger Tool Co., Beloit, Wis., has modified its No. 224 double-spindle face grinder as shown in the accompanying illustration. The machine is provided with an extra-long table which carries the work to be ground in and out between the two parallel grinding wheels.

This table or platen is mounted on fourteen roller bearing rolls and four side rolls. All rolls are completely incased and protected against the entrance of grit. They are mounted on eccentric studs so that alignment can be secured and maintained. The table is driven with a separate 5-hp. motor through a bull-gear and rack.



Badger No. 224 Double-Spindle Face Grinder with Extra-Long Table

The speed of the table on this particular machine is 15 ft. per min., but by the use of change gears various speeds up to 25 ft. per min. can be obtained. The length of table overall without aprons is 11 ft. and the width 18 in. The travel is 72 in. The piece of work being ground is a cast-iron boiler section measuring approximately 48 in. long by 17 in. high by 4 in. wide. The piece is quickly clamped in the fixture shown and by operating the control levers the piece passes between the wheels, which are automatically fed up to independent micrometer stops. The production claimed is 25 pieces per hour.

The main spindles are 3½ in. in diam. and are mounted on both radial and thrust ball bearings, having Alemite lubrication. Each spindle is connected to a 20-hp. motor through a "Fast" flexible, sliding coupling with 2-in. lateral travel in each coupling. The entire machine, with the exception of the spindles, is lubricated with the Bowen "one-shot" system. The cylinder wheels are 24 in. in diam. and the maximum opening between wheels is 24 inches.

The operating floor space is 16 x 24 ft. while the complete weight of the unit is 24,000 pounds.

Trade Catalogs

BEVEL GEAR GENERATORS. Gleason Works, Rochester, N. Y., has published a catalog on its bevel gear generators that ranks as a work of art for publications of this type. The book is bound in a stiff cover, leather covered, and is profusely illustrated throughout with large size photographs and line drawings. The typographical arrangement is pleasingly combined with the illustrations. A brief resumé is first given of the design, manufacture and advantages of spiral bevel gears. The calculation of thrust loads follows. The gear generators are first treated in general and then specifically by machine size and type. Straight bevel gear planers of various types are also included. In the latter part of the book a complete discussion on spiral bevel gear manufacture is given, including forging, machining, heat-treating and adjustments in use. Standard mountings are also shown, and standard gear sets are tabulated for various ratios and powers.

NEWS OF THE WEEK

Steel Treaters' Technical Program Covers All Important Phases of Industry

Welding, Automotive and Metallurgical Societies Aid

A TECHNICAL program, comprising almost fifty papers and discussions, has been arranged for the annual convention of the American Society for Steel Treating, which will be held in Detroit during the week of the National Steel and Machine Tool Exposition—Sept. 19 to 23. In addition to the technical sessions of the steel treaters, there will be convened at this time the fall meeting of the Institute of Metals, the annual meeting of the American Welding Society, and the production meeting of the Society of Automotive Engineers. There will be joint sessions throughout the week, when members of the four organizations will meet to discuss common problems.

The Papers

A list of the papers and their authors to be included in the steel treaters' program, is as follows: "Deep Etch Method of Testing Steel," by H. G. Keshian, Chase Metal Works; "Metallurgy and Aircraft," by H. C. Knerr; "Uses of Gas in Steel Treating and Forging," by W. M. Hepburn, Surface Combustion Co.; "Hardening by Reheating after Cold Working," by M. A. Grossmann and C. C. Snyder, Central Alloy Steel Corporation; "Practical Experience in the Field of Heat Treatment of Wire and Rods for the Making of High Strength Wire by the Process of Patenting," by J. S. G. Primrose, Manchester, England.

"Fatigue Strength of Case Carburized Steel," by N. J. Alleman and H. F. Moore, University of Illinois; "Corrosion Fatigue of Alloys of Nickel, of Copper and of Aluminum," by D. J. McAdam, Jr., engineering experiment station; "Testing Automobile Body Sheet Steel," by Joseph Winlock and G. L. Kelley, E. G. Budd Manufacturing Co.; "Graphic Magnetic Pictures of Internal and External Stress," by A. V. deForest, American Chain Co.; "A Critical Study of the Bend Test as Applied to Iron and Steel," by A. B. Kinzel, Union Carbide and Carbon Research Laboratory.

"Steel Melting Practice," by W. H. White, Duquesne Steel Foundry Co.; "The Melting Stage of Steel Making," by G. A. Dornin, Gathmann Engineering Co.; "Armco Ingot Iron," by R. L. Kenyon, American Rolling Mill Co.; "The Manufacture and Uses of Wrought Iron in Present Day Industry," by James Aston, Carnegie Institute of Technology; "Carburizing Iron by Mixtures of Hydrogen and Methane," by W. P. Sykes, General Electric Co.; "Physical Properties of Nitralized Steel," by V. O. Homerberg, Massachusetts Institute of Technology; "Gas Carburization of Steel," by R. G. Guthrie and Dr. O. J. Wozasek, Peoples Gas Light and Coke Co.; "Studies of Normal and Abnormal Carburizing Steel," by O. E. Harder, L. J. Weber and T. E. Jerabek, University of Minnesota.

"Cutting Carbides," by H. M. German, Universal Steel Co.; "Manufacture and Use of Hacksaw Blades," by H. B. Allen, Henry Disston & Sons, Inc.; "Evaluating Quality of High-Speed Steel Tools," by J. B. Mudge, Western Electric Co.; "The Constitution of Hardened Steels," by W. P. Sykes and Zay Jeffries.

"Production of Single Crystals," by J. A. M. Van Liempt; "Quantitative Spectrum Analysis," by F. Twyman and D. M. Smith; "Monel Metal and Nickel," by C. A. Crawford; "Significance of Physical Properties of Steel Determined at Elevated Temperatures," by F. B. Foley, Midvale Co.; "Wear of Plug Gages," by H. J. French and H. K. Herschman, Bureau of Standards; "What Happens When High-Speed Steel is Quenched," by B. H. DeLong and F. R. Palmer, Carpenter Steel Co.; "Plastic Deformation of Metallic Crystals," by T. A. Wilson and S. L. Hoyt, General Electric Co.; "Expansion Properties of High Nickel Steels," by Howard Scott, Westinghouse Electric and Manufacturing Co.

"Determination of the Heterogeneous Field in Iron Nickel Alloys," by Dr. Kotaro Honda and Sansaku Muira, Tohoku Imperial University, Sendai, Japan; "Ball Bearing Steels," by Dr. Pengt Kjerrman, S.K.F. Industries, Gothenburg, Sweden; "Physical Properties and Structure, Longitudinally and Transversely, of Heat-Treated Chromium-Molybdenum Sheet of Various Sizes," by R. R. Moore and F. T. Sisco, Wright Field; "X-Rays and the Constituents of High Alloy Steel," by E. C. Bain, Union Carbide and Carbon Research Laboratory; "Economic Use of Nickel Chromium Alloys in Gray Iron," by D. M. Houston, International Nickel Co.; "Uses of Stainless Iron in the Manufacture of Nitric Acid Plants," by W. M. Mitchell, Central Alloy Steel Corporation.

"Design From the Heat-Treating Standpoint," by G. M. Eaton, Molybdenum Corporation of America; "Forging Machine Die Practice," by E. R. Frost, National Machinery Co.; "High Temperature Treatment of Castings and Forgings," by W. J. Merten, Westinghouse Electric and Manufacture Co.; "Special Heat-Treating of High-Carbon Steel for Cold Forming Dies," by F. L. Wright, Atlas Ball Co.; "Locomotive Forging Steels," by O. V. Green, Reading Co.

"Comparison of Brinell, Rockwell and Scleroscope Tests," by R. R. Moore, Wright Field; "Refractories and Abrasives," by H. F. Beecher, Norton Co.; "Machinability of Metals," by O. S. Boston, University of Michigan; "High-Speed Diffraction, Using High Voltage Radiation," by Dr. Ancel St. John.

Machinery Export Trade Growing Steadily

Since long before the war the export trade in American machinery has been showing marked and continuing expansion, according to the industrial machinery division of the Department of Commerce. In the period between 1915 and 1921, this trade was greatly stimulated, but apart from that boom, the trade has shown consistent and satisfactory growth, expanding from about $50,000,000 in 1910 to $156,000,000 in 1926.

Latin American countries have for several years absorbed about one-third of these exports, those of Europe about one-fourth, Canada and Newfoundland about one-fifth, and the countries of Asia about one-eighth.

Money has decreased in purchasing power since pre-war years by possibly 35 per cent, but inasmuch as this export trade, as expressed in dollars, is three times the volume of 1910, it is clear that the trade is expanding rapidly even after allowance is made for price changes.

In spite of the lower costs of production in foreign countries and keen European competition, the United States is still able to export very important quantities of machinery to European countries; more than $38,000,000 worth was shipped last year. In the last two years the United Kingdom has absorbed more than $18,000,000 worth annually of American machinery; Germany more than $3,000,000 worth; France nearly $5,000,000 worth annually, with prospects for a larger business when conditions become more stable; Belgium and Spain about $1,000,000 worth a year each, while Italy is in the $2,000,000 class. Canada is our best customer.

Industry in France Shows Improvement Despite Many Economic Obstacles

Exports fell off in the last few weeks

By Our Paris Correspondent

THE general situation in France is still liquid, with a tendency towards improvement if not actual stabilization. The weak point lies in the unsatisfactory relation of imports and exports, the latter having fallen to a disappointing level in the last few weeks.

General prices for products of the metal trades are believed to be as low as overhead, carrying charges, the wage scale and the cost of fuel and current will allow. As compared with gold values elsewhere than in France, the products of many French manufacturers of machinery and tools are underpriced. Highly specialized items may here and there show exceptions, but much that enters into the current consumption of the times by no means carries a price tag that compares with the figures on similar articles in Italy, Switzerland or Belgium.

This might suggest a buyers' market, but given the conservatism which is temperamentally and traditionally French the manufacturer is for the most part awaiting those orders which he hopes will materialize from buyers who for one reason or another are still holding off. It should not be ignored that in most lines French production capacity is far greater than actual output, an uneconomic situation which was commented upon by many of the delegates at the recent International Economic Conference at Geneva as applying to many European countries as a result of the continued existence of so many war industry plants now idle but carrying overhead charges of no small total.

Both interior and exterior French politics and economics have a bearing on things as they are and things as they might be, or as hoped to be. The tariff reform bill which has threatened for many months, and which actually got before parliament, is shelved for the moment and the provisional agreement with Germany as to reciprocity extinguished itself on June 30 and no arrangements have been made for a *modus vivendi* pending the adoption of a more prolonged term agreement.

The French machinery and tool trades are somewhat seriously affected by the anticipation of future France-German commercial treaties. On one hand France may henceforth be able to export little to Germany but on the other hand, owing to various reparations clauses, is obliged to collect some measure of her due in kind. That this will have some bearing on the dealings of American machinery manufacturers with France there can be no doubt.

In 1910 the tool and machinery industries in France benefited from a protection running from 6 to 8 per cent when figured on an *ad valorem* basis, though steel and other semi-products were taxed double. The import of machinery and machine tools progressed constantly from 55 million francs in 1892, to 321 million francs in 1913, an increase of 480 per cent, half of which was attributable to Germany.

By 1926 these imports had increased to a value of above two billion paper francs—some four hundred odd millions gold, due, it is claimed, to an insufficient protection. A "sufficient protection" today will call for a minimum of 18 per cent and a maximum of whatever height it may be boosted to under pressure of the local manufacturer.

The United States and Germany will be the most affected; in spite of the increased protection already granted by the employment of the coefficient system of figuring import dues, imports of American agricultural machinery alone amounted to the value of 250 million francs in 1926.

The advent of an era of non-fluctuating prices, more than anything else, is looked to stimulate home trade. A difficult situation has arisen in the machine wire industry and its output in various manipulated forms due to the German-Belgo-Luxembourg cartel. In spite of the competition French exports in this line doubled their value in the first five months of the present year. Bolts and nuts are not being stocked commonly in great volume, but special orders have been booked by makers from both railway and building trades. Black and galvanized tubes are in demand. Accessories and hardware fittings for automobile and railway coach-work are being ordered but in small quantities and at low prices. The chain industry finds some activity in quarters where it had not been looked for but not in large volume and prices are being cut to command business in many cases where it is claimed that there is little profit in the transaction. Steel and metal stampings from the specialized Ardennes plants are finding some current business, largely from the railway stock and shipbuilding plants. The trade in transmission units and parts which was active in April and May has slowed down. Woodworking machinery is dull, but transport and lifting appliances are finding some market by reason of improvements and modernization being added in many old plants.

Replacement parts are being sought by the bicycle and automobile industries in some appreciable quantities, compensating for the general slump in these lines. Citroen and Renault appear to be the only automobile firms still holding up to quantity output, though the Mathis firm at Strasbourg is putting out a new small car with virtually a "square" motor, having abandoned the long-stroke, high-speed type. The Peugeot company is increasing its capital from 60 million to 90 million francs, evidently in anticipation of an increased output to meet the annual need of France for 300,000 automobile units, a figure vouched for by the director of the organization and given out to the public over his signature. The figure is believed to be decidedly optimistic in many quarters.

High railway freights are still proving a handicap to the machinery and tool industry as to many other heavy trades. The situation in the Saint Etienne district in mid-France is typical. Metal working tools shipped to Paris pay 405 francs the ton as compared with 27 francs in 1914. On the basis of the general index number costs, even putting it as high as 600, this should not be more than 180 francs—the rest is added to the selling cost, perhaps two hundred francs on an item selling at a thousand francs. Rates from other centers are much the same.

Machine Tool Trade in Great Britain Shows First Improvement of Year

Census report of the British Board of Trade

By Our London Correspondent

IT IS possible to report during the last few weeks some improvement in the machine tool trade, particularly in small or medium-sized machines. Most of the recent orders have come from the automobile industry, and they have been spread over the various districts a little more evenly than usual. The automobile industry itself is somewhat unevenly occupied; the seasonal stimulus has naturally diminished and probably in this section the peak of unemployment has definitely been passed for the year. Some firms have undoubtedly had a good season; on the other hand more than one must report a decline in output, and one or two for various reasons have definitely closed down for short periods. The decline has in some circles been regarded as sudden, but, on the other hand, the warning might have been heard by those that had ears to hear. The cycle trade, whether pedal or motor, has not altogether reached expectations. The overseas dominions have continued to be good customers, but India has not taken her share.

Manufacturers of electrical machinery and apparatus have continued to be well employed; in fact, some of the larger firms have found it necessary to get certain machining work done outside their

PRODUCTS, 1924	SELLING VALUE *Pounds*
(A) *General Engineering.*	
Machinery and parts thereof:	
Agricultural machinery:	
Grass and lawn mowers	944,000
Other agricultural machinery	2,316,000
Air and gas compressors and exhausters	1,007,000
Blast furnace and steel works plant	951,000
Boilers and boiler house plant (including economizers, feed-water heaters, steam superheaters)	7,516,000
Boot and shoe making machinery	730,000
Brewing and distilling machinery	585,000
Condensers	899,000
Conveyors, telphers, transporters	1,085,000
Cranes, hoists and other lifting machinery not elsewhere specified	4,303,000
Food preparation machinery	1,603,000
Gas and chemical machinery	1,788,000
Grain milling machinery	580,000
Heating and ventilating plant	541,000
Hydraulic machinery (except hydraulic prime movers)	589,000
Laundry machinery	1,195,000
Machine tools (metal working)	3,366,000
Marine machinery	13,778,000
Mechanical power transmission plant	1,213,000
Mining machinery:	
Mining coal cutters	595,000
Other (including washing and screening plant, pitgear, etc.)	1,812,000
Paper-making machinery	1,179,000
Prime movers (not electrical) other than marine engines, locomotives and tractors	9,229,000
Printing, bookbinding, etc., machinery	2,575,000
Pumps, not included elsewhere	1,898,000
Refuse and sewage disposal plant	739,000
Road making machines	769,000
Sugar-making and refining machinery (other than centrifugal)	817,000
Textile machinery	18,195,000
Weighing machinery	1,846,000
Wood-working machinery	876,000
Machinery and parts, not elsewhere specified	11,819,000
Machinery accessories, not elsewhere specified	3,036,000
Total value of machinery, parts and accessories	100,374,000
Airplanes, airships and parts (other than engines)	981,000
Locomotives, rail	4,265,000
Tractors (including steam rollers)	1,366,000
Railway and tramway equipment and plant	2,540,000
Special steels	147,000
Iron and steel castings	4,493,000
Iron and steel forgings	1,524,000
Tools and implements	516,000
Other manufactures of iron and steel	4,570,000
Manufactures of brass and other metals (other than iron and steel)	759,000
All other products	4,815,000
Iron and steel structural work	9,823,000
Repair and jobbing work	13,950,000
Other work done	541,000
Work in progress at the end of the year	28,827,000
Total value	179,491,000
Less work in progress at the beginning of the year	25,670,000
General engineering: Total value of goods made and work done in the year	153,821,000
(B) *Electrical Engineering:*	
Electrical machinery and parts	15,432,000
Carbons, electric (including furnace electrodes)	565,000
Electric lamps and parts	2,432,000
Telegraph and telephone apparatus	3,872,000
Wireless apparatus	4,845,000
Thermionic valves	1,262,000
Electric wires and cables, insulated	18,444,000
Primary batteries	768,000
Accumulators (including parts)	3,520,000
Electric lighting accessories and fittings (including switches)	1,561,000
Switchboards (other than telegraph and telephone)	1,659,000
Electricity meters	1,064,000
Electrical goods and apparatus, not elsewhere specified	3,948,000
All other products	5,451,000
Contract work (electrical) in United Kingdom	3,150,000
Repair or maintenance work for customers	1,965,000
Total value, electrical engineering	69,938,000
Total value, general engineering	153,821,000
Total value of goods made and work done	223,759,000

shops. The heavier side has very little cause for anxiety, but the demand for the smaller motors, etc., has been handicapped, it is thought, by uncertainty regarding the outcome of the new electricity supply schemes. One branch of engineering from which Great Britain had fallen away before the war has been revived, namely, the production of water turbines. An order for such turbines with electric generators totaling about 40,000 hp. has recently been placed with one electrical engineering firm. It is stated to be the largest installation of its kind in Great Britain.

As a continuation of the preliminary reports being prepared by the British Board of Trade on the census of production for the year 1924, details have been issued regarding the engineering trades. Separate sectional reports relate to electrical machinery and apparatus, marine engines, other prime movers including boilers, textile machinery and machine tools. The motor and cycle trades have been the subject of an earlier report. The aircraft industry is not fully represented, this applying also to railway and tramway equipment and plant, special steels, castings and forgings and to some structural engineering. Engineering work carried out in certain instances, as by railways, at cost and not on a profit basis, and other work done by local authorities, government departments, and so on, are omitted, and there are other reservations. The list here given provides details of outputs relating to Great Britain only.

The outstanding feature is the marked advance of electrical engineering, which is about one-third of the total, whereas in 1907, according to the census of production then made, it was about 14 per cent. Other features suggested by the figures are declines in textile machinery and steam engines.

Turning to machine tools, the total output for the year is entered as £3,366,000, of which £2,200,000 was made by machine tool firms, the remainder being made by other engineering firms. The figures given are selling values. The returns as to weight are incomplete. As far as they go they indicate a total of 24,365 tons, but this does not apply to much more than half the total value of the machine tools entered. The machine tool firms also manufactured other goods to the total value of £588,000 and carried out repair and jobbing work valued at £104,000. Thus, after making due allowance, it is estimated that the value of goods made and the work done by machine tool firms during 1924 amounted to £2,895,000. Deducting cost of material, etc., the value of the net output is estimated at £1,810,000, giving a net output per person employed of £187. This compares, as stated, with £199 for engineering as a whole, or £213 for electrical engineering, £164 for marine machinery, £194 for prime movers and boilers, etc., £225 for heating, ventilating, etc., and £186 for textile machinery. Employees in the machine tool industry, as represented by machine tool firms, numbered some 9,677, of whom 8,214 were operatives.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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THE Ship of American Business is sailing on placid summer seas. They are not exciting, there is not enough motion to cause serious discomfort, and there are but few complaints to be heard. In the course of a recent trip which carried him through many of the larger cities of the South and Southwest, the writer met only two men who were not cheerful and conservatively optimistic.

One was the proprietor of several large and well-known hotels who insisted that his summer business was smaller than for several years. He claimed that people were not spending or traveling as usual, and that the hotel capacity of the country was largely in excess of the demand because so many unneeded hostelries had recently been built. Other hotel proprietors since interviewed do not entirely confirm this view, but none of them are exuberant, and while it is dangerous to generalize from casual observation, it must be admitted that the Pullman cars seem to be less crowded than usual at this season, and that lower berths are easier to obtain on short notice.

The other complainant was a large dealer in Ford cars. He said that the article published in the June *Harper's* under the caption "Confessions of a Ford Dealer" was an understatement of the predicament in which most Ford dealers found themselves, and he added that the whole country had stopped buying automobiles while waiting for the new Ford car. When his attention was drawn to the increased sales reported by General Motors and others, his answer was that the total production was under last year and that the aggregate decrease in sales exceeded the decrease in production.

As no authoritative figures of automobile sales are available, it is impossible to gainsay this latter statement, and it is published for what it may be worth as a straw which shows the flow of the economic current. Some other straws from which similar conclusions may be drawn are, however, to be found in the week's statistics. Thus, car loadings for the week ending July 16 were about 5 per cent under the same week last year, and 34 important railways report net earnings for June that average 15 per cent under the same month in 1926. Another statistical exhibit that has attracted wide attention is an analysis of savings bank returns prepared by W. P. Hazelgrove, a lawyer of Roanoke, Va., by whom it was submitted at a recent meeting of the Virginia Bankers' Association. It shows that the increase in savings accounts for the year ending June 30, 1926, was $400,000,000 less than the gain for the preceding year, although the number of depositors had increased by 3,000,000. It also shows that the average savings account increased by only 56 cents during the year ending June 30, 1926, whereas interest at 3 per cent on the average balance as of June 30, 1925, would have amounted to more than $15 a year.

Mr. Hazelgrove suggests that these figures may reflect the increase in installment buying and the use of current earnings to meet the obligations given for things so purchased. This is, however, debatable, for the figures are a year old and it is quite possible that much of the money that might have gone into the savings banks has been used to buy stocks and bonds, in which so many thrifty Americans have latterly learned to invest. But be this as it may, it is worth noting that some of the largest savings banks in New York City are now advertising that they will pay 4½ per cent on deposits, whereas the Federal Reserve Bank in Kansas City has reduced its rediscount rate to 3½ per cent, at which figure call money is in abundant supply on the New York Stock Exchange despite an increase of $82,000,000 in broker's loans for the week ending last Thursday and an eager demand for good commercial paper at 4¼ per cent.

There are, however, but few who seem disposed to pay any attention to these statistical niceties, and most business men and investors appear to be confident of a prosperous autumn and another year of good earnings for our corporations.

Upon this belief, plus easy money, the stock market has been firm and active, with United States Steel and General Motors in the lead. Current gossip is that the duPonts, who dominate General Motors, have acquired a large interest in the steel corporation, and it has even been suggested that the present chairman of the former company may succeed Judge Gary as chairman of the "steel trust." For many reasons, this is to be doubted, but when the speculative imagination is excited, almost anything is "a good enough Morgan until after the election," and it is altogether probable that the recent strength of the stock market has been largely due to the rumors referred to.

Most industries are on an even keel, and distributive trade is normal for July. The cotton market is also normal in that it is acutely responsive to weather conditions. As this is written, speculators are evening up in the fear that the government report to be issued Aug. 8 will show that the crop is in a better condition than it was a year ago.

WHAT'S DOING IN INDUSTRY

IT IS a little too soon to say what were the total sales figures in the machinery industry for July. But it is pretty certain that the volume was in many instances better than June, and the future, judged by the number and the character of inquiries, should develop some substantial increases in many lines.

MILWAUKEE presents the most encouraging picture this week, with orders and inquiries generally more active. A slight falling off is reported from Cincinnati, but this is said to be the usual seasonal slump. A further decline in sales but better prospects from quotations is the report from Cleveland. The anticipated improvement in Detroit, encouraged by a recent flurry in sales, has not yet become a reality. Chicago sales are confined to necessities, but prospects are reported exceptionally bright.

NEW ENGLAND territories continue to lead in activity in the East. The New York market is spotty, small tool and supply dealers getting the bulk of curent sales. Activity picked up in Buffalo in the last half of July and general business is fair. Philadelphia reports a favorable tone, some good business being in sight.

THE SHIP of American Business is sailing on placid summer seas: they are not exciting and few complaints are to be heard.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CINCINNATI

A slight falling off of business in the past week is reported by machine tool manufacturers located in the Cincinnati district. However, it is stated by the majority that the demand for tools is better than it was at this time last year and the present market recession is regarded as merely a seasonal lull. Selling agents report that business held up very well during the week, taking the season into consideration.

The majority of the orders received during the week called for single tools and replacements, the purchases being well diversified in the matters of size and type. The buyers were general machinists and miscellaneous users. Some scattered buying was done by railroads, electrical manufacturers and concerns in the automotive industry.

Manufacturers report that considering the fact that it was in the vacation season, a fair number of inquiries came in during the week. The trade reported that in the past week business was better than it was in the same period of the previous year. Manufacture was maintained at its former level through the week and no reduction of production is expected.

MILWAUKEE

Business in metal working equipment has been enlivened to some extent by a few orders from automobile plants, and the promise appears to be for more business from this source within the next few weeks as production needs become more clearly defined and needs more urgent. Otherwise, business is still relatively quiet, although signs of improvement are visible. Machine shops have limited their purchases to bare necessities, and those which are experiencing increased business are finding themselves obliged to make some additions to production equipment. In few cases, however, do these requirements call for more than a few items.

Local shops report that while new business is decidedly spotty, the aggregate of sales is increasing. Generally speaking, production facilities are ample to handle current orders and beyond making necessary replacements, there is little incentive to acquire additional equipment. A report from Madison, Wis., says that the Gisholt Machine Co. has been working overtime to produce a quantity of crankshaft balancing machines for the Ford Motor Co. for rush delivery.

BUFFALO

While the first two weeks of July continued to be generally dull in the machine tool trade in Buffalo, it is interesting to note that there was a flurry of interest and activity during the third week of July. It is too early to say at this time whether or not this is more than of passing interest.

This flurry consisted both in the placing of some orders which had been held up for various reasons and also in the receipt of more inquiries than usual.

In the electrical equipment field business continues to be fair with a slight reflection of the interest in the machine tool trade. There are no big orders in the local field which involve the electrical equipment dealers and manufacturers, but there is a profitable volume of small orders. In fact the volume is probably more profitable than that of one year ago when the gross sales were much larger because of some big contracts. Conditons are probably more satisfactory in this field than in any other portion of the trade.

PHILADELPHIA

A few orders for single tools, and some inquiries having a favorable tone, featured the Philadelphia machinery and machine tool market during the last two weeks. Orders came from general industrial concerns over a scattered area, some shapers, lathes, millers and drill presses being in demand.

One of the city's leading industrialists whose plant deals with railroad equipment reported this week that "the business outlook is good, but just now there is nothing but outlook." There have been no purchases from the carriers to lend a hopeful appearance to the situation, but the heads of firms are confident that railroad business eventually will come and that when it does it will be of a substantial volume.

Manufacturers of gears reported some sales to paper and pulp mills and there has been some movement in transmission machinery. There has been virtually no demand for used machinery. The automotive industry has shown little disposition to enter the Philadelphia market.

NEW ENGLAND

Inquiries received by manufacturers in the New England territory in the past week is indicative of a substantial volume of business in the offing, and the final quarter of the year is expected to develop into the best three-months period of the year. A substantial amount of the prospective business is from the automotive industry and the opinion of most manufacturers is that the changes in models is going to be helpful to the trade. The increased interest in aviation arising from the transatlantic flights and from the Lindbergh tour is expected to reflect ultimately in the trade. In fact some recent buying has been from the airplane production industry.

The volume of orders for export delivery has shown a slight improvement recently. As communities are establishing airports there is a better demand for small equipment.

DETROIT

The anticipated improvement in the machinery market in Detroit has not materialized yet and conditions here are about as they were three or four weeks ago. Two weeks ago there was a little flurry that gave some promise of a permanent and material change for the better. But this week the market has slumped again and neither the orders nor the inquiries indicate that it will pick up immediately.

The automobile industry is, of course, almost the entire source of revenue for dealers in machinery and machine tools and for the many tool shops here. All of the other industries combined, and that includes the railroads, building and road construction, scarcely bring 5 per cent of the total business of the district. At this time the sale of automobiles is not sufficiently high to warrant the purchase of new equipment and almost without exception the manufacturers are marking time.

Some of the machinery dealers and a few automobile men predict that the fall business will far surpass that of any recent year, but even if it does the average for the year is quite likely to be below the average for the last four or five years.

General Motors has not bought much of anything for some time and is apparently not planning on making any immediate purchases. The contemplated expansion of the Yellow Truck and Coach plant at Pontiac will not materialize for many months.

CLEVELAND

The local machine tool market experienced further declines in sales in the past fortnight. July, according to present indications, promises to be one of the poorest months of the year. A tone of optimism prevails, however, as the slow down in business is attributed to summer dullness. A gradual increase in buying is expected after September first.

Orders booked recently were for single tools from industrial users. Ford purchased several tools, presumably for experimental purposes. The Goodrich Rubber Co. has issued a list for its new plant in Los Angeles. Used tool business is fair, with a dearth of good tools.

NEW YORK

Sales of machinery and machine tools in this market continue to run in a more or less uneven line. No large orders have been placed, most of the volume being represented in sales of single pieces to buyers scattered throughout the territory. Some dealers expressed optimism over the fact that some of the larger industrialists have become active inquirers for certain types of high efficiency equipment. It is believed that many of the tools that were purchased earlier in the year for experimental purposes have proved satisfactory, and that the next few months will see the placing of orders for complete batteries of production machines.

A feature of this market is the substantial increase in business to agents and jobbers in small electrically-driven tools and garage equipment. One such jobber reports that June was the biggest month he had closed in several years. Sales of this class of equipment are mostly to structural iron, sheet metal, garages and automobile repair shops.

CHICAGO

Practically no change in the condition of the machine tool market is reported for last week. Demand is largely limited to necessities for equipment replacement, with the exception of electrical and pneumatic tools which find a good sale. The local representative of one of the largest Eastern manufacturers of electrical equipment stated that, while there had been no material falling off in sales at any time since the year began, the prospects for a big fall and winter demand were bright.

Grinding machinery has shown a slight decline in the volume of business done since spring, but the demand for abrasives continues on a satisfactory level. Manufacturers of hack- and band-saws report an excellent trade for the month of July.

Railroads, with the exception of the Chicago, St. Paul, Minneapolis & Omaha road, which is negotiating the closing of items outstanding on its list, are doing practically no buying at this time. Used tools are in small demand, and dealers are agreed that not before September do they expect any change in the market.

Wages and Hours Increase in Auto Industry

A recent bulletin of the Bureau of Labor Statistics presents the results of the 1925 study of wages and hours of labor in the motor vehicle industry in the United States.

The study covers 144,362 wage earners of 99 representative establishments in eight States, employed in the manufacture of passenger cars, trucks, busses, and bodies and parts. Comparative summary figures from the 1922 study of the industry are included.

The 1925 averages for all occupations combined are: Full-time hours per week, 50.3; average earnings per hour, 72.3 cents; average full-time earnings per week, $36.37. The 1922 averages are: Full-time hours per week, 50.1; average earnings per hour, 65.7 cents; and full-time earnings per wek, $32.92.

The 1925 occupational average earnings per hour range for males from 51.2 cents for "apprentices" to $1.037 for "dingmen," and for females from 36.1 cents for "inspectors" to 69.6 cents for "lathe operators."

The report also contains information relating to changes in wage rates; bonus systems; overtime; and growth of the industry in capital invested, value of products, number of wage earners, total amount paid in wages, and average yearly earnings of wage earners.

Chicago Machinery Club

The Machinery Club of Chicago has moved into its new quarters at 671 W. Washington Blvd., in Chicago. The rooms have been completely refurnished and many new conveniences have been included in the planning of the club. In order to properly introduce this new home of the machinery trade in Chicago, the officers have planned several social affairs for the coming season and it is expected that the members, and the out-of-town machinery men will avail themselves of the opportunity to inspect the clubhouse.

Fifty Per Cent Increase in Motor Vehicles

In the three years from Jan. 1, 1924 to Jan. 1, 1927, there was an increase of 52 per cent in the registration of four-wheel motor vehicles throughout the world, representing an absolute increase of 9,437,000 vehicles, according to a census by the United States Department of Commerce. The registration of passenger cars increased 48 per cent during this time, while that of motor trucks and buses increased 76 per cent. The total number of buses and trucks in use on Jan. 1, 1927 is estimated to have been 4,131,000 which represents an absolute increase during the three years previous to that date of 1,786,000 vehicles.

The United States contains the greatest number of motor vehicles of any country in the world, and in fact many more than all other countries combined. Of the total world registration of approximately 27,650,000 passenger cars, trucks and buses on Jan. 1, 1927, 80 per cent were in the United States.

Though this represents a very rapid expansion in the use of motor vehicles, it is not so great an increase as shown by the rest of the world. On Jan. 1, 1924, the remainder of the world outside the United States had 2,931,000 cars, buses and trucks. Three years later there were 5,512,000, an increase of about 88 per cent, or almost double the increase shown by the registrations in this country.

Davis and Fouche Are Awarded the Morehead Welding Medal

The International Acetylene Association has formally presented the Morehead Medal to Augustine Davis of New York, and to Edmond Fouche of Paris. The presentation was made on June 21 at the Union League Club, in New York, in the presence of members of the association and of other technical organizations. The presentation was made in person to Mr. Davis and to the French Consul on behalf of Mr. Fouche. The Morehead Medal is awarded for distinguished service in the development and promotion of acetylene and the oxyacetylene process in their applications to the varied metal working trades.

To Mr. Fouche is credited the invention of the oxyacetylene welding torch. In February, 1904, he sent to Eugene Bournonville, in New York, one of these torches, with which Mr. Bournonville welded a broken machine section which was afterwards used for many years. It was the first welding done in this country using acetylene and oxygen in a high temperature flame, to do what had been theretofore restricted to the blacksmith forge and anvil. Mr. Bournonville was a former associate of Mr. Fouche in the Societe Acetylene Dissous in France, and in 1901 made the first installation of a plant in the United States for generating and compressing acetylene gas in portable cylinders as dissolved acetylene, the business being established by the late Commodore Benedict as the Commercial Acetylene Co.

The award to Mr. Davis was in recognition of his notable service to the industry through the introduction, development and promotion of acetylene generators, and in the development and introduction of apparatus — torches, pressure regulators, generators and automatic machines — for oxyacetylene welding and cutting.

Mr. Davis, now in his seventy-fifth year, retired from active participation in the oxyacetylene industry in 1922, but the line of Davis-Bournonville apparatus has been continuously manufactured since the first use of the oxyacetylene process in this country. It is now the Airco-Davis-Bournonville line of apparatus.

Penn State College Offers Industrial Course

The twelfth annual summer conference for industrial executives will be held under the joint auspices of the departments of industrial engineering and engineering extension of the Pennsylvania State College from Aug. 22 to Sept. 3. The program at these conferences deals with those problems of organization that effect executives from the foreman to the president.

Costs, personnel problems, factory location and layout, time study, wage payment plans, industrial economics and other topics of like character form the major items of discussion. Three discussions per day, lead by a faculty member, are held over a period of two weeks. Since the discussions are as practical as it is possible to make, there are no scholastic requirements for admission.

Further information can be obtained by writing to Prof. C. W. Beese, head of the industrial engineering department, Pennsylvania State College, State College, Pa.

Airport at Montreal

The Dominion government has selected a site on the South shore of Montreal for an airport with facilities for airplanes and dirigibles, according to a recent report. Numerous places were inspected by representatives of Canada and Great Britain. The decision in favor of Montreal was made chiefly because of its connection with the St. Lawrence River. A large mooring mast will be erected to accommodate the dirigibles that the British government intends to place in operation next year between London and Montreal.

British Workmen Like American Tools

American hand tools are recognized in the British market for their quality and dependability, a trade bulletin issued by the commerce department states. The fine finish of American tools and the manner in which they are labeled and packed have been important factors in the sale of American tools in the United Kingdom, it is pointed out. British manufacturers realizing this fact have begun to adopt American patterns and advertise their tools as American type but British make.

According to the bulletin, 80 per cent of British imports of saws, 70 per cent of rasps and files and more than half of the carpenter's and engineer's tools are of United States origin. The United Kingdom, the report shows, is not only a large buyer of foreign hand tools but also a large exporter. The greater part of the British exports are destined for countries within the Empire although Latin American countries are becoming prominent in this trade.

Personals

GEORGE R. SHUMAN, dealer in machine tools, has opened a display room at 510 South Harding St., in Indianapolis.

T. D. LYNCH, manager of the materials and process engineering department of the Westinghouse Electric & Manufacturing Co., sailed for Europe on Aug. 1. He will study manufacturing methods in Germany and England.

H. L. PURDY, vice-president, and C. J. SHERER, treasurer of the Marmon Motor Car Co., of Indianapolis, have sailed for a month's visit in central and western Europe. They will visit approximately sixty Marmon dealers while abroad.

PROF. I. G. ALEXANDROV, one of the pioneers in the development of the Dnieper River power project in Russia, has arrived in the United States to inspect and study large scale hydro-electric power plants and equipment factories.

C. E. WILSON, president and general manager of the Delco-Remy Corporation, of Anderson, Ind., is reported much improved at the Mayo Brothers Hospital in Rochester, Minn., where he underwent an operation.

JOHN MCGEORGE, formerly chief engineer for the Wellman-Seaver-Morgan Co., and works engineer of the Oakland Motor Works, has moved from Cleveland, Ohio, to Los Angeles, Calif., and has opened an office in the Chamber of Commerce Bldg. He will do consulting engineering work.

MERWYN R. BARNTHOUSE, assistant sales manager of the Wayne Co., of Fort Wayne, Ind., has been made assistant to the company's Western manager, J. G. Rodman of San Francisco. Mr. Barnthouse became an employee of the company in 1920, and later became engineer in charge of sales.

E. D. TREANOR has been appointed managing engineer of the distribution transformer department at the Pittsfield, Mass., works of the General Electric Co. As managing engineer of that department, Mr. Treanor will also have general supervision of the engineering on distribution transformers manufactured at the Fort Wayne, Ind., and Oakland, Cal. plants.

Business Items

The Toledo Machine and Tool Co., announces plans for the construction of an addition to its plant at Toledo, Ohio.

The Joseph Tracy Testing Laboratory has been appointed as official testing plant for the New York Automobile Club.

Most of the machinery at the new plant of the Ames Shovel Co., Anderson, Ind., is in place and the plant is expected to be in operation within a few weeks.

The Central Foundry Co.'s plant at Vincennes, Ind., closed for the past eighteen months, will open shortly, according to F. A. Ferguson, vice-president of the company.

The Graybar Electric Co. has awarded contracts for the construction of a new warehouse at Knoxville, Tenn. It will be ready for occupancy before the end of the summer.

The Chicago Pneumatic Tool Co., of New York, announces the removal of its Seattle branch office, service station and warehouse from Jackson St., to 1743 First Ave., in that city.

The plant of the Nicholson File Company at Anderson, Ind., has returned to its regular schedule following a vacation of about ten days when the annual invoice of the plant was taken.

The Lincoln Electric Co., of Cleveland, has opened a branch office at 220 Nicholas Bldg., Toledo, Ohio. A. H. Homrighaus, formerly in charge of the Missouri territory, has been placed in charge of this branch office.

The Missouri district office of the Lincoln Electric Co., of Cleveland, has been moved from the Railway Exchange Bldg., in St. Louis, to 1003 Davidson Bldg., in Kansas City. Robert Notvest is manager of this branch.

Announcement has been made of the expansion of the American Foundry Equipment Co., at Mishawaka, Ind., to include the McArthur line of rod straightening and shear machines. In the future this equipment will be known as the American-McArthur line.

Announcement has been made in Indianapolis that the Relay Motors, Inc., organized under New Jersey laws, but having its principal offices in Wabash, Ind., has purchased the Garford Truck Co. plant in Lima, Ohio. No change in the operation of either the Lima or Wabash plants is expected for the present.

The Van Dorn Electric Tool Co. announces that its New York sales rooms, at 30 Church St., will be enlarged to include a storeroom and service station for the handling of spare parts and emergency orders. Mr. Horner, manager of this office, states that the new offices will be ready within a week.

The Muscle Shoals Supply Co., a new machinery and tool distributing concern at Sheffield, Ala., has announced that the company is interested in getting in touch with manufacturers of all classes of equipment for contractors, with a view to handling these lines if satisfactory connections can be made.

The Lincoln Electric Co., of Cleveland, Ohio, announces that the annual custom of shutting down the plant and sales offices for a vacation period will be followed this year from Aug. 8 to 20. During this vacation only a skeleton organization will be maintained in the general offices at Cleveland, to handle emergency spare parts and orders for shipment from stock.

The merger of the Bucyrus Company, steam shovel manufacturer at Evansville, Ind., with the Erie Steam Shovel Co., of Erie, Pa., has been completed. The merger has been in progress for some time. The Erie plant is about the same size as the Evansville plant, but manufactures a smaller shovel. The Evansville plant was established 16 years ago.

The Western Electric Co. has announced that its warehouse and distributing office at Savannah, Ga., maintained there for the past 20 years, will be closed by Sept. 1, and that business will henceforth be handled in that territory from the Jacksonville, Fla., branch. J. C. Willis, manager of the branch, will be transferred to the main Southeastern branch in Atlanta.

The Warner Gear Co., of Munice, Ind., has filed an amendment to its corporation papers reclassifying its stock from 10,000 shares at $100 each to 100,000 shares of no par value. The company also has filed an increase from 100,000 shares of no par value common to 210,000 shares of no par value common and $1,750,000 preferred. The number of directors of the company has been increased from seven to nine.

The American Rolling Mill Co. has acquired the property, plants, business and patents of the Columbia Steel Co., and the Forged Steel Wheel Co., at Butler, Pa. and Elyria, Ohio. These properties add another complete manufacturing unit, from pig iron through to finished product, to Armco's producing forces. This amalgamation brings together under the banner of Armco these two developments which cover the mechanical operation in the manufacture of sheet metal, either in the form of sheets or strips, and gives Armco control of at least 1,000,000 tons per year of finished product. The Columbia Steel Co. will, for a period as yet undetermined, be operated as a separate company, but the entire product will be sold by Armco.

Auto Production Down

June production of motor vehicles in the United States, as reported to the Department of Commerce, was 314,552 of which 274,374 were passenger cars and 40,178 were trucks, as compared with 395,674 passenger cars and trucks in May and 380,372 in June, 1926.

The report is based on figures received from 156 manufacturers in the United States for recent months, 53 making passenger cars and 121 making trucks (18 making both passenger cars and trucks).

Machinery Featured at Paris Fair

The Paris Fair held recently had 6,530 exhibits, says a report to the Department of Commerce. There was a notable increase in the groups comprising machinery and office equipment, foodstuffs and Paris articles. A feature was the creation of a new separate group devoted to industrial and commercial automobiles and tractors. Another innovation was a hall for moving pictures in which exhibitors were given the opportunity of showing their manufacturing equipment and processes.

The total number of exhibitors from foreign countries increased sharply over that of last year and notably with regard to American, British, Austrian, Italian and Belgian firms.

Forthcoming Meetings

Steel and Power Show. First Steel and Power Show in the Varsity Arena, Toronto, Canada, sponsored by the Montreal and Toronto Chapters of the American Society for Steel Treating; by the Canada, Toronto and Hamilton Councils of the Universal Craftsmen's Council of Engineers; by the Engineers' Mutual Benefit Fund; the American Electroplaters' Society; and the Canadian section of the American Welding Society. Aug. 31 to Sept. 2. General chairman, C. Bradshaw, 153 University Ave., Toronto, Canada.

American Railway Tool Foremen's Association. Fifteenth annual meeting, Hotel Sherman, Chicago, Aug. 31, Sept. 1 and 2. G. G. Macina, secretary, 11,402 Calumet Ave., Chicago.

Machine Tool Exhibit. Seventh annual machine tool exhibition under the auspices of the New Haven Section of the American Society of Mechanical Engineers, the Department of Mechanical Engineering of Sheffield Scientific School, Yale University, and the Chamber of Commerce of New Haven: At the Mason Laboratory, Yale University, Sept. 6 to 9. Harry R. Westcott, chairman of the exhibit committee, 400 Temple St., New Haven, Conn.

American Society for Steel Treating. Ninth annual convention and national steel exposition, Detroit, week of Sept. 19. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

Society of Automotive Engineers. Production Meeting, starting at Hotel Winton, Cleveland, Sept. 19 and 20; continuing at Hotel Statler, Detroit, Sept. 21 and 22. C. E. Heywood, manager of meetings, 29 West 39th St., New York City.

American Welding Society. Fall meeting, Book-Cadillac Hotel, Detroit, Sept. 19 to 23. M. M. Kelly, secretary, 29 West 39th St., New York City.

Institute of Metals. Sectional meeting, Hotel Statler, Detroit, Sept. 19 to 23. H. Foster Bain, general secretary, 29 West 39th St., New York City.

National Steel and Machine Tool Exposition. Under the auspices of the American Society for Steel Treating. Convention Hall, Detroit, Sept. 19 to 23. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Machine Tool Builders' Exposition. First annual machine tool exposition, conducted by the National Machine Tool Builders' Association, at the West Annex of the Public Auditorium, Cleveland, Ohio, Sept. 19 to 24. J. Wallace Carrel, vice-president and general manager, the Lodge & Shipley Machine Tool Co., Cincinnati, chairman of the exposition committee. Roberts Everett, manager of the exposition, Pennsylvania Bldg., New York. Ernest F. DuBrul, general manager of the association, 826 Provident Bank Building, Cincinnati, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

STEEL bars, shapes and plates adhere very firmly, in the present market, to the price of $1.80 per 100 lb., f.o.b. Pittsburgh mill, for the base sizes. No cutting under, whatever, is being recognized by the principal makers in this material. Pig-iron prices continue weak and at the low point of the last five years. Improvement in demand for the non-ferrous metals, noted last week, is still in force; scrap prices are higher, with the exception of one or two of the items on the iron and steel list. Buying for automotive and agricultural implement requirements is in better prospect; that for railway steel and sheets, in some localities, appears slower.

(All prices as of July 29)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$22.19
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	26.37
BIRMINGHAM	
No. 2 Foundry	17.25
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	27.17
Basic	21.76
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	23.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.76
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.25	3.50	3.25	3.89
No. 12	2.30	3.55	3.30	3.94
No. 14	2.35	3.60	3.35	3.99
No. 16	2.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.80	3.75	3.75	4.00
No. 22	2.95	3.90	3.90	4.15
No. 24	3.00	3.95	3.95	4.20
No. 26	3.10	4.05	4.05	4.30
No. 28	3.25	4.20	4.20	4.45
Galvanized				
No. 10	3.15	4.10	3.95	4.25
Nos. 12 to 14	3.25	4.20	4.05	4.35
No. 16	3.35	4.30	4.15	4.45
No. 18	3.50	4.45	4.30	4.60
No. 20	3.65	4.60	4.45	4.75
No. 22	3.70	4.65	4.50	4.80
No. 24	3.85	4.80	4.65	4.95
No. 26	4.05	5.05	4.90	5.20
No. 28	4.30	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded.	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded.	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches — ¼	⅜	½	¾	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.75 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅛, 8.35c.; ¼, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, ⅜@¼-in. thick.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, up to carlots, New York			14.25
Tin, pigs, 5-ton lots, New York			65.50
Lead, pigs, up to carlots, E. St. Louis 6.32½		New York	7.10
Zinc, slabs, up to carlots, E. St. Louis 6.32½		New York	7.25

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	15.00	17.50	13.00
Copper sheets, base	21.75	21.50	21.75
Copper wire, base	18.50	18.25	15.00*
Copper bars, base	21.25	21.25	21.25
Copper tubing, base	23.75	23.50	23.75
Brass sheets, high, base	18.00	17.75	18.00
Brass tubing, high, base	22.87½	22.62½	22.87½
Brass rods, high, base	15.75	15.50	15.75
Brass wire, high, base	18.50	18.25	18.50

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26.02
Zinc sheets (casks)	11 00	11 30	10.11
Solder (½ and ½), (case lots)	39.00	42 00	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			82.00
Commercial genuine, intermediate grade			61.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			13.00
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35 00	Electrolytic 39.00	Shot	36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11 25 @11.50	10.50	9.75@10 25
Copper, heavy, and wire	10.50 @11.00	10 50	9.00@ 9 50
Copper, light, and bottoms	9 25 @ 9.75	9.00	8.00@ 8.50
Heavy lead	5 12½@ 5 37½	5.25	4 50@ 4.75
Tea lead	4.12½@ 4.37½	3.25	3.00@ 3.50
Brass, heavy, yellow	7.25 @ 7.50	6.75	6.25@ 6.75
Brass, heavy, red	8.50 @ 9.00	9.25	8.50@ 9 00
Brass, light	5.00 @ 5.25	6.00	5.50@ 6 00
No. 1 yellow rod turnings	7.12½@ 7.62½	7.00	6.50@ 7.00
Zinc	3.75 @ 4.00	3.00	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.15½	36.00 per M	15
Sal soda, per lb	03½	02	02¾
Roll sulphur, per lb	02⅞	03½	04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.84	.91	.83½
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	27	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	30–10–5%
Heavy grade	30–10%	30–10%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb	.1525	.1525	.1687½
Solder (½ and ½)	per lb.	39	.41	.40
Cotton waste, white	per lb.	.10@13½	10@ 13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	65	.65	.55
Machine oil	per gal.	27	33	35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
*Flint paper	$5.13	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1 29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton, Connellsville			3.00@3.25
Coke, prompt foundry, per net ton, Connellsville			4.25@4.75
White lead, dry or in oil,	100 lb. kegs	New York,	13.75
Red lead, dry,	100 lb. kegs	New York,	13.75
Red lead, in oil,	100 lb. kegs	New York,	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Broken Kegs or Cases	Full Kegs or Cases
Machine bolts, square heads and nuts:		
Up to ¾ x 6-in	50%	50–10%
Larger up to 1 x 30-in	45%	50%
1¼ and 1½ in. dia	30%	35%
Carriage bolts:		
Up to ½ x 6-in	50–10%	
Larger sizes	50%	
Coach and lag screws:		
Up to ½ x 6-in	50–10%	
Larger sizes	50%	
Tap bolts, hexagonal heads	45%	
Nuts:		
Hot pressed, square and hexagonal, blank or tapped	45%	50–10%
Cold punched, square and hexagonal, blank or tapped	45%	50–10%
Semi-finished, hexagonal, tapped, in packages	40%	
Case hardened, hexagonal, tapped, in packages	30%	
Washers: Deduct from list, per 100 lb	$1.50	$3.50
Rivets, button and cone head:		
Small, including ⅞-in. dia		50–10%
Large (base) per 100 lb	$6.50	$5.00

EXTRA per 100 lb. on rivets: For ½-in. dia., 35c.; ⅝-in., 15c.; 1-in., 5c.; length 1-in. and shorter, 25c.; longer than 1-in. up to and including 1 ½-in., 15c.; longer than 5-in., 25c.; standard countersunk head, 25c.

Machine Requirements and Industrial Construction

Equipment Wanted

Mo., St. Louis—Utility Tool Co., 620 Tower Grove Ave.—lathe, 18 ft. between center, 30 in. swing or over.

Pa., Pittsburgh—Acme Stamping & Mfg. Co., 201 Corliss St.—open back gap press, capacity 100 to 125 ton pressure.

S. C., Holly Hill—Chapman Storm Corp.—equipment including lathes, punches, shears, shapers, etc. for machine shop.

Tex., Donna—Great Western Motor Co., R. J. Lynn, Oakland, Calif.—machinery and equipment for proposed 1 story assembling plant, here. Estimated cost $100,000.

B. C., Vancouver—Vancouver Machinery Depot Ltd., 1156 6th Ave. W.—complete machinery and equipment for machine and boiler shop.

Ont., Brantford — Workrite Radio Co., Gupther Bldg., W. Babcock, Mgr.—machinery and equipment for the manufacture of radios for proposed plant.

Ont., Kincardine—Andrew Malcolm Furniture Co., J. Malcolm, Gen. Mgr.—wood working equipment for the manufacture of furniture for proposed 3 story, 50 x 100 ft. addition to factory. Estimated cost $50,000.

Que., Montreal—H. Musy, 5280 7th Ave., Rosemont, complete equipment for proposed repair and service garage. Estimated cost $10,000.

N. Z., Wellington—Dept. of Public Works, Supplies & Tenders—will receive bids until Nov. 15 for one-ton overhead traveling crane for Waikarembane Power Scheme.

Opportunities for Future Business

Calif., Alhambra — Kay-Brunner Steel Casting Co., Glendale, has acquired a site and plans the construction of a foundry here.

Calif., Los Angeles—C. H. Johnson, Commercial Exchange Bldg., is having plans prepared for the construction of a 13 story garage on South Broadway. Estimated cost $750,000. K. MacDonald, Jr., Spring-Arcade Bldg., Archt.

Calif., Los Angeles—Normandie Improvement Syndicate, c/o S. C. Clark, 6001 Santa Monica Blvd., Contr., awarded contract for the construction of a 6 story, 100 x 125 ft. garage at 8th St. and Normandie Ave. Estimated cost $165,000.

Calif., Los Angeles—U. S. Spring Co., 1124 South Los Angeles St. and U. S. Rubber Co., 796 South San Pedro St., awarded contract for the construction of a 1 story, 120 x 415 ft. factory on Magnolia Ave. Estimated cost $100,000.

Calif., Los Angeles — Woolwine Metal Products Co., 2421 East 8th St., awarded contract for the construction of three 1 story factory buildings on 52nd St. Estimated cost $90,000. Noted July 28.

Calif., Santa Rosa — Santa Rosa High School Dist., awarded contract for the construction of a 1 story shop. Estimated cost $26,871.

Conn., Bridgeport — Packard - Bridgeport Motors, Inc., 170 Cannon St., is having plans prepared for the construction of a 1 story, 100 x 225 ft. garage on Fairfield Ave. Estimated cost $175,000.

Conn., Hartford—O'Meara Motor Co., 997 Main St., East Hartford, awarded contract for the construction of a 2 story repair and service garage at Connecticut Blvd. and Darlin St., here. Estimated cost $75,000.

Conn., Hartford—White Co., B. M. Holden, 750 Main St., will receive bids until Aug. 6 for the construction of a 1 story, 150 x 150 ft. service station on Maple Ave. Estimated cost $100,000. Private plans. Noted June 30.

Ind., Elkhart—Kilbury Auto Co., awarded contract for the construction of a 2 story, 100 x 120 ft. machine shop and garage at Harrison and Marion Sts. Estimated cost $45,000.

Ia., Sioux City—Sioux City Gas & Electric Co., is having plans prepared for the construction of a 2 story, 150 x 180 ft. service building. Estimated cost $200,000. U. G. I. Contracting Co., 1401 Arch St., Philadelphia, Archt.

Mass., Boston—Back Bay Hotels Garage Inc., 260 Tremont St., had revised plans prepared for the construction of a 3 story garage at Columbus Ave. and Dartmouth St. Estimated cost $500,000. G. N. Meserve, 260 Tremont St., Archt.

Mass., Brighton (Boston P. O.)—Heil Hoist Co., 298 Havard St., is receiving bids for the construction of a 1 story service station, etc., at North Beacon and Market Sts. Krug & Smith, Milwaukee, Archts.

Mass., Brookline (Boston P. O.)—Hotel Beaconsfield, 1731 Beacon St., awarded contract for the construction of a 1 story garage and repair shop on Beacon St. Estimated cost $70,000. Noted June 30.

Mass., Cambridge (Boston P. O.)—Massachusetts Institute of Technology, W. S. Stratton, Pres., awarded contract for the construction of a 3 story, 60 x 150 ft. engineering building here. Estimated cost $225,000.

Mass., Fall River—D. J. Dennis, 6th St., awarded contract for the construction of a 1-story repair and service garage. Estimated cost $45,000.

Mass., New Bedford—City, W. P. Hammersley, Municipal Bldg., plans the construction of a 1 story repair and service garage on Smith St. Estimated cost $50,000. Private plans.

Mass., Somerville (Boston P. O.)—Edison Electric Light Co., 39 Boylston St., Boston, is receiving bids for the construction of a 1 story addition to service station on Willow St. here. Estimated cost $40,000. Private plans.

Mass., South Boston (Boston P. O.)—R. S. Brine Transportation Co., 43 India St., Boston, is receiving bids for the construction of a 1 story, 70 x 120 ft. repair and service garage at 194 West First St., here. E. C. Luce, Jr., 14 Beacon St., Boston, Archt. Noted June 30.

N. J., Belleville (Newark P. O.)—Wallace Tierman Co., 1 Mill Blvd., Newark, awarded general contract for the construction of a 4 story plant for the manufacture of chlorine control apparatus on Mill St., here. Estimated cost $150,000.

N. J., Jersey City—Public Service Electric & Gas Co., Terminal Bldg., Newark, will build a 1 story, 35 x 50 ft. transformer repair house at Hackensack River and Penn Horn Creek. Estimated cost $49,000. Public Service Production Co., 80 Park Pl., Newark, Archts.

N. J., Paterson—J. A. McCrane Motors Co., 638 Market St., is having plans prepared for the construction of a 1 story, 100 x 300 ft. garage at Market and 36th Sts. Estimated cost $150,000. G. E. Sleight & Son, 136 Washington St., Archts.

N. J., Trenton—Golding Sons Co., Peace St., awarded contract for the construction of a feldspar grinding plant. Estimated cost $250,000.

N. Y., Brooklyn—Mergenthaler Linotype Co., 29 Ryerson St., awarded contract for the construction of an 8 story, 70 x 304 ft. factory at 14-22 Ryerson St. Estimated cost $400,000.

O., Chillicothe — Dept. of Highways & Public Works, G. F. Schlesinger, Dir., Ohio-Hartman Bldg., Columbus, awarded contract for the construction of a 1 story, 80 x 3000 ft. repair and service garage here. Estimated cost $42,720. Noted June 16.

O., Cleveland—American Brass Mfg. Co., J. Arth, Pres., 1525 East 49th St., awarded contract for the construction of a 2 story, 20 x 70 ft. addition to factory. Estimated cost $40,000.

O., Cleveland—American Stamping Co., E. H. Krueger Secy., 978 East 64th St., awarded contract for the construction of a 1 story, 51 x 148 ft. factory at 985 East 63rd St. Estimated cost $40,000.

O., Cleveland—The Cleveland Twist Drill Co., 1242 East 49th St., awarded contract for the construction of a 1 story, 80 x 140 ft. factory at 4717 St. Clair Ave. Estimated cost $40,000.

O., Cleveland—The Sheets Elevator Co., J. M. Sheets, Pres., awarded contract for the construction of a 4 story, 110 x 113 ft. warehouse at 6529 Broadway. Estimated cost $175,000.

O., Hamilton—Hamilton Casting & Mfg. Co., J. Weigel, Pres., had plans prepared for the construction of a 1 story, 54 x 216 ft. addition to factory. Private plans.

O., Jackson—Wick Bros., awarded contract for the construction of a 1 story, 50 x 86 ft. repair and service garage. Noted July 14.

O., Wheelersburg — Wheelersburg Wood Ware Co., manufacturers of wood heels, plans the construction of a 2 story addition to factory. Estimated cost $50,000.

Pa., Philadelphia — Roberts Nash Co., Broad and Thompson Sts., will soon award constract for the construction of a 5 story, 52 x 160 ft. sales and service station. Estimated cost $300,000. P. S. Tyre, 114 South 15th St., Archt.

Pa., Philadelphia—A. Winegard, c/o E. A. Roth, Drexel Bldg., will soon award contract for the construction of a 2 story, 40 x 180 ft. garage at 2731 S. 4th St.

Pa., Philadelphia — Wintz Bros., 1618 Sellers St., will build a 2 story, 54 x 61 ft. shop. Estimated cost $10,000. Private plans.

R. I., Providence—The White Co., East 79th St. and St. Claire Ave., Cleveland, O., awarded contract for the construction of a 2 story, 100 x 200 ft. repair and service garage at Branch Ave. and Dryden Lane, here. Estimated cost $100,000. Noted July 7.

Tex., San Antonio—Goad Motor Co., Navaroo and Augusta Sts., will receive bids until Aug. 10 for the construction of a 2 story, 165 x 167 ft. garage at Dallas and Lexington Sts. Estimated cost $125,000. H. P. Smith, c/o National Bank of Commerce Bldg., Archt. and Engr. Noted Feb. 17.

Wis., Chippewa Falls—Motor Bus Co., is having plans prepared for the construction of a machine shop and garage.

Wis., Green Bay—Wisconsin Public Service Corp., Bellin Bldg., will build a 2 story, 60 x 90 ft. shop on Washington St. Private plans.

Wis., Milwaukee—R. W. Dwyer, 187 27th St., Archt., will soon award contract for the construction of a 1 story, 130 x 299 ft. sales and service station. Owner's name withheld.

Wis., Sheboygan—W. C. Weeks, Ontario Ave., Archt., is receiving bids for the construction of a 1 story, 53 x 66 ft. service station for Schniderwind & Zehms, 1401 Indiana Ave. Estimated cost $40,000. Noted Apr. 28.

Wis., Tomah—Chicago, Milwaukee & St. Paul Ry., Union Station, Chicago, Ill., awarded contract for the construction of a 1 story, 40 x 80 and 40 x 60 ft. shop here. Estimated cost $40,000.

Wis., Wausau—Wisconsin Valley Electric Co., H. L. Gressi, Mgr., 206 3 rd St., will build a 1 story, 96 x 185 ft. repair shop. Estimated cost $42,000. Oppenhamer & Obel, Archts.

Wis., Wisconsin Rapids—Prentice-Waber Co., 1430 2nd St. N., manufacturers of stoves, plans the construction of a 1 story, 50 x 200 ft. factory. Estimated cost $50,000. Architect not selected.

B. C., Nanaimo—Nanaimo Lumber Co. Ltd., plans the construction of a lumber mill, 100,000 ft. daily capacity. Estimated cost $75,000.

Ont., Toronto—G. A. Stimson & Co., 300 Bay St., awarded contract for the construction of a 10 story, 158 x 210 ft. garage, etc. at Front and Bay Sts. Estimated cost $1,500,000.